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The Need for Standardization of Hub Designs

With large losses to equipment makers, car manufacturers and owners resulting from the present multiplicity of such designs, Mr. Schipper appeals here for more simplicity in the production of hub parts. He has made a thorough study of the field and his statements are made with a force of authority.

By J. Edward Schipper

MILLIONS of dollars are being wasted annually because of the lack of hub standardization. This applies to both the passenger car and truck fields. Wheel and axle manufacturers are suffering alike from this situation and, although there have been one or two attempts to standardize axles, with a view toward limiting the number of wheel mountings and hub designs, nothing has resulted. This matter affects not only the manufacturer but also the user of cars, as it is a serious expense for each. At the present time, when there is a growing tendency on the part of owners to ask for wire or disk wheel equipment, the situation is becoming almost impossible.

It is true that practically every difficulty which one could think of is in the way of standardizing this part of the chassis but, nevertheless, there are good reasons to believe that the force of opinion of both wheel and axle manufacturers is sufficient to carry this matter through, should an earnest effort be put into it. If it was possible during the war to bring manufacturers together on a common ground on problems far more difficult than this, it should be possible now to obtain that co-operation which will work to the benefit of the entire industry.

It is only necessary to consider for a moment the difficulties confronting a manufacturer in the wire or disk wheel business. In the passenger car field he has perhaps a hundred types of axles requiring a hundred different hub designs, for which he must make manufacturing provisions. He must secure dies, jigs and fixtures and tool his plant to turn out varying quantities of each type. Until he has gone through this entire list and put himself in a position to manufacture each of these hubs, he is not in a position to supply wheels for every make of car. Automobile manufacturers have repeatedly been turned down by makers of disk and wire wheels who were unable to turn out the particular type of hub for that particular car, because they simply had not got to the point where they could take care of its manufacture.

It has been argued by some that there is no possibility of making any consistent standard unless the simple type of live axle is used universally. That is the type employed by such concerns as Pierce-Arrow, Packard, Hudson, Jordan, Studebaker, Peerless, Premier, Ford, etc. This viewpoint no doubt is correct in a measure, as it would be impossible for any committee to set itself up as opposed to designs made by representative axle manufacturers who do not use that particular type.

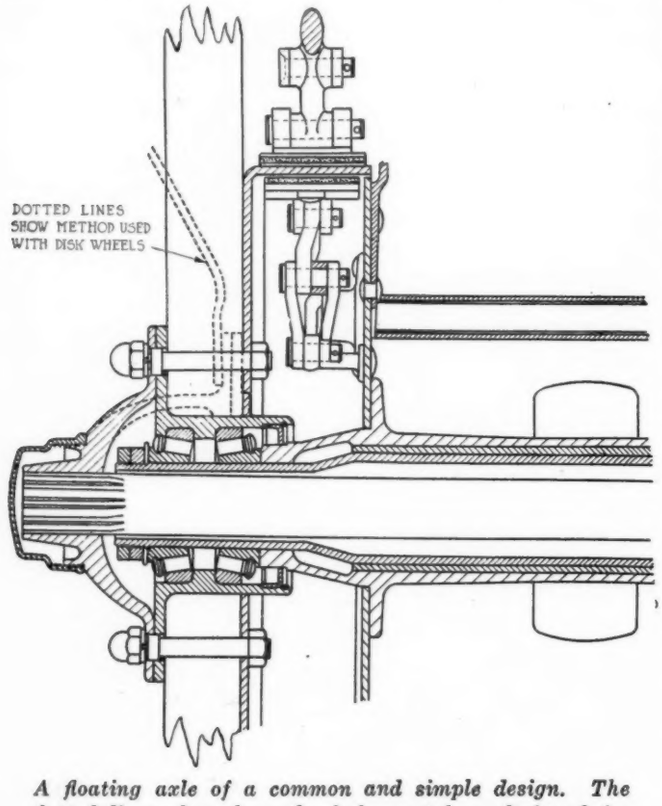
Even allowing for the fact that at least for several years we are going to have full, semi- and three-quarter floating axles, it is possible to reduce the number of hub designs in use. One of the peculiar features of the situation is that some of the small, low-priced cars require much more expensive and bulky hub equipment than do the axles used on the more expensive cars, and this regardless of the type of wheel used.

Three Axle Types to Remain

It would be premature at this time to attempt to get axle manufacturers together on a decision of what is the best all-around design as regards the full, semi- or three-quarter floating types, and for all manufacturers to decide in future to work along that design. Some day this happy situation may materialize, but from the present viewpoint it looks almost as remote as the time when "the lion and the lamb shall lie down together."

While the situation has been realized by all concerned for a long time, there has been no real effort put behind it, largely because of the realization of the difficulties confronted every time a committee holds a meeting. Nevertheless, it is recognized that axle manufacturers could do wonders toward helping wheel manufacturers, if they could get together. Axles could be standardized, at least as to the length and diameter of the spindles in the different classes such as the semi, three-quarter and full floating.

A concrete example of what the wheel maker has to contend with may be given. In one particular car, one of the lowest priced on the American market, it is almost impossible to build a satisfactory wire wheel because the rear spindle is so much shorter than the front that to get a tracking tread it is necessary to make a great overlap on the rear. This situation leads to the breakage of the axle shaft or chewing out of the bearings on the rear. This type of axle works satisfactorily with wood wheels, but since many users of the car demand wire wheel equipment, it seems quite reasonable that the axle manufacturer might lengthen the spindle to make it satisfactory to the wire wheel maker.



A floating axle of a common and simple design. The dotted lines show how the hub must be redesigned for one type of disk wheel

It is not too much to state that the engineering problem put up to a wheel manufacturer is one of the most vexatious now before the industry, and as one wheel man puts it, "At times we almost think that every axle engineer is trying to make the problem more difficult, instead of trying to simplify matters."

This situation, although bad, is no worse than what confronted us during the war. The memories of the attempts of the manufacturers themselves to standardize tire sizes are still fresh in our minds. One of the things really accomplished during the war was the reduction of tire sizes. This was done by a definite action of the War Industries Board to the great benefit of the entire industry, in spite of all the claims of impossibility that were advanced.

Sacrifices Necessary

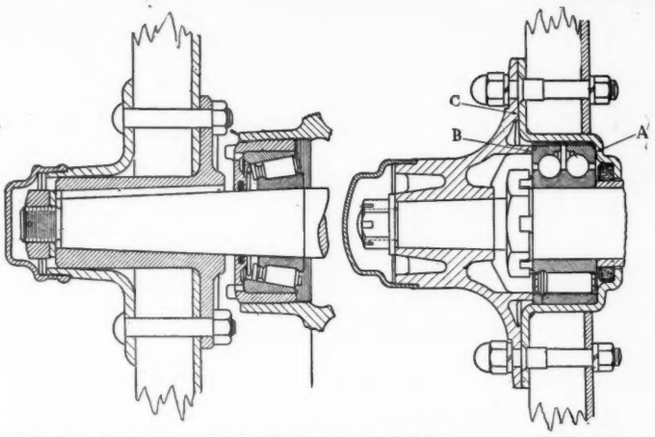
To accomplish the desired result it will be necessary that some sacrifices be made by axle manufacturers but, nevertheless, in the long run it will result to the benefit of not only these makers but to the industry in general. It cannot be denied that a greater interchangeability of parts for service and repair shops, a smaller die cost because of the fewer dies required by forging concerns and reduced cost and increased convenience to the car manufacturer would be bound to result.

With demand as it is at the present time and with no real competition in the field, the opportunity is here for manufacturers to overcome the reluctance of the past to changing their axle layouts and the tool equipment for producing them. Full cognizance of the difficulties has been taken by the writer and, in fact, by all who have made any kind of a study of the problem, but the more it is studied the more forcibly one is brought to the conclusion that now is the time to push this movement.

The disk wheel industry is in its infancy. There is a standing demand for wire wheels on the part of certain users, and there is no reason why the wood wheel manufacturer should be compelled to take into consideration the great variety of hub designs now confronting him.

While this sounds as if it were going to entail considerable loss to axle manufacturers they, too, will gain in the end. It will be possible for them to concentrate their entire facilities on a smaller variety of hubs, reducing the cost of production and tending toward reduction of the price of car manufacture. That, in turn, means increased production. The jobber and the dealer would be able to carry in stock a far smaller assortment of parts, some of which now have but little call and represent only dead capital on the shelf.

Axle manufacturers are not particularly interested in standard designs of hubs for wire and disk wheels. Nevertheless, they are interested in bringing about a standardization on wood and steel wheel hub designs. Taking the passenger car field, the axle maker supplies the hubs for the wood wheels, as a rule, and the customers of the axle



Left—A type of hub that presents little or no difficulty to the wheel manufacturer, and which lends itself readily to standardization

Right—A difficult type of hub, from the wheel manufacturer's standpoint. Note points A, B and C, which must be highly accurate to prevent bearing slap

manufacturer who use wire or disk wheels provide for the hubs themselves. In other words, they secure the hubs from the wheel factory. It would be an exceptionally heavy expense for the axle maker to carry in stock hub patterns for all the different makes of wire and disk wheels. If standardization were secured it would make it possible for the axle factory to furnish wire or disk wheel hubs without such an expense.

There is not an axle manufacturer who has not had considerable difficulty in trying to adapt standard wood wheel hubs to various designs of steel wheels. This standardization could be carried to cover the hub barrel diameter, the hub bolt circle, and the size and number of hub bolts.

Certainly standardization of the hubs would be in the direction of simplicity. From a manufacturing standpoint, that is always desirable; and, if it is possible to develop the simplest type of hub for each of the three types of axles, that is, the full, semi- and three-quarter floating, and, if necessary, three series for light, medium and heavy weight cars, a big step would have been taken. That would lead to a minimum of nine standard hub designs, with a possibility of ten or twelve, a big reduction from the present number, in the neighborhood of one hundred for passenger cars alone. Nevertheless, it is not much more of an undertaking to do this than it has been to standardize certain other features.

When a situation is found like the one cited above, where it is much more expensive and complicated to manufacture a hub for a low priced car than one for a high priced machine, there is certainly reason enough for manufacturers to take vigorous steps toward remedying it. Machinery for the creation of these standards is already in existence. There are committees representing the Wood Wheel Manufacturers' Association, the Metal Wheel Manufacturers' Association and the Society of Automotive Engineers. Co-operation between these bodies has been pledged and some preliminary meetings have been held. These committees have before them a work presenting exceptional difficulties because it will be necessary in the creation of these standards to make important modifications in the design of certain axle types.

In the long run, however, it will be a benefit rather than a detriment to the axle manufacturers affected, because the changes will be in the direction of simplicity and will tend to make big reductions in production costs. The matter must be regarded frankly and with an open mind. It is evident that if it is possible to manufacture a hub for the Cadillac, Pierce-Arrow or Packard cars, which are known for their standards of engineering but have reasonably simple designs with low manufacturing costs, it is feasible to use similar practice in producing axles for lower priced cars rather than to utilize some form of design that gives no better performance and in which the manufacturing costs run from 200 to 300 per cent higher.

It is, of course, a rather embarrassing situation for an engineer to go to the executives of his concern and state that the axle would have to be redesigned to meet the standards requirements and then to find that he is getting lower priced manufacture and better performance. Yet in some cases this might readily occur. But when it is considered that the lack of standardization in these parts is causing the loss of millions to the industry, personal pride should be laid aside.

Capital Tied Up in Tools

If it is necessary for a wheel factory to be equipped to produce eighty different kinds of hubs and if it costs, on an average, $2,000 per hub to tool for production, it is apparent that a needless amount of capital becomes tied up in tools, jigs and fixtures before an ounce of material is bought or a machine started. The result is that car manufacturers who want wire wheels or disk wheels on a portion of their production cannot secure them unless they happen to be one of those who are using an axle for which the wheel maker is in a position to supply the hub.

This analysis of the situation is made largely from the passenger car standpoint, but it applies just as forcibly to truck wheel manufacture. Now that we have a greater diversity of wheel types than ever before, and with production growing, we should not delay much longer in standardizing this part. A canvass of the field of the manufacturers interested indicates unanimous opinion that the movement should be carried on at once, and, where there is so much will, there should certainly be a way.

If we grant that the passenger car field must have three basic types of axles, the floating, semi-floating and three-quarter floating, and that each should have three series, a light, heavy and medium, this would make nine designs as a minimum. Even with twelve, or double that number, we would have accomplished a tremendous good.

An International Council for Scientific Research

THE report of the conference held in Brussels last summer at which the constitution of an International Research Council was finally agreed upon has been completed and will be published in a few weeks' time. It was agreed that the convention should come into force on Jan. 1 last, provided that at least three of the following countries should have signified their adhesion: Belgium, Brazil, the United States, France, the United Kingdom, Australia, Canada, New Zealand, South Africa, Greece, Italy, Japan, Poland, Portugal, Rumania, and Serbia. The requisite number of acceptances have been received.

The purpose of the council is to co-ordinate international efforts in science and its applications; to initiate the formation of international associations or unions deemed to be useful to the progress of science; to direct international scientific activity in subjects outside the purview of existing international associations; and to enter into relation with the governments of the adhering countries in order to promote investigations. The legal domicile of the council will be at Brussels where the general assemblies will be held and the archives kept. Donations and legacies will be received and administered according to Belgian law.

Makers of Six Nations Show Tractors at Paris

Several new European machines are described in this article, which reveals that France will have need of some 25,000 tractors in the next ten years. French production and various changes in design are discussed, and estimates made of the probable output of several European factories.

PARIS, March 12.

FRANCE seems to be afraid of tractor competitions, for this year, instead of her spring tractor trials, she has merely organized an exhibition in the Tuileries Gardens, in the center of Paris. The event is under the control of the French Syndicate of Tractor Manufacturers. As an exhibition it is good, for the location is excellent, and, having been well advertised, visitors are numerous.

The claim is made by many, however, that competitions and not exhibitions are required. Farmers should be given figures and not adjectives. Last autumn England had real trials at Lincoln from which officially checked figures were available for the benefit of farmers. In France there never has been a tractor competition in which it was possible for one machine to show up to better advantage than another. Dissatisfied with the exhibition only, the importers of foreign tractors decided to hold demonstrations at the same time, and for this purpose secured a farm to the west of Paris, where all the foreign machines could be seen at work. The French makers were obliged to follow this example, but instead of uniting, each worked on his own initiative. While all the foreigners can be seen at work on one day, it is necessary to spend a day for each of the French machines carrying out demonstrations on scattered farms.

The exhibitors represent six nations, as follows: France, England, America, Italy, Switzerland, and the Czechoslovak Republic. The French makers are Renault, Tourand-Latil, Somua, Delahaye, Doizy, Peugeot, Atlas, Dubois, De Dion-Bouton, Chapron, Bauche, Filtz, René Pétard, Scemia, and Douilhet. The greater number and the more important of these are automobile manufacturers.

Italy has two machines on exhibition, the Fiat and the Pavesi. Switzerland has sent the Berna tractor, built by the leading Swiss truck maker. The Czechoslovak machine comes from the Laurin-Klement automobile factory at Prague. Austin is the only representative from England. Many of the American machines are presented under French names, and there appears to be a tendency to pass them off as French productions. The lot comprises Fordson, Happy Farmer, McCormack, Moline, Gray, Case, Hart-Parr, Mogul, Titan, Avery, Whitney and Sandusky. Several American machines took part in the demonstrations, but were not on exhibition in Paris.

According to a statement made by the president of the French Syndicate of Tractor Manufacturers, French requirements are 25,000 tractors to be delivered within a period of ten years. The claim is made that the French industry is now in a position to meet all requirements. This is not borne out by facts, for no French makers can guarantee immediate deliveries and not one has yet fully developed his program. Renault, who is the biggest maker, expects to reach an output of 100 per month very shortly. At the present moment Renault is behind on deliveries and the situation is made worse by inability to get freight cars for delivering finished machines.

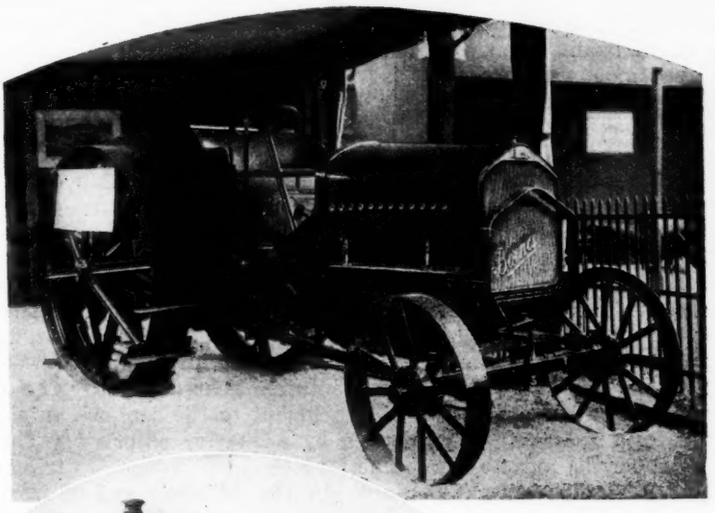
There are two makers of track-laying machines in France, Renault and Peugeot. The former machine is a modification of the tank which Renault built in very large numbers during the last year of the war. All the armor plating has been removed; the motor, instead of being at the rear, has been placed forward, but except that the creeper bands are narrower, there is practically no difference between the Renault tank and the Renault tractor.

After a year's experience on the land, Renault has found it possible to make improvements in his tractor. The first of the new machines was on exhibition; deliveries will be made in July. Practically no change has been made in the engine, which is a four-cylinder, 30-hp. type, practically identical with the one used on the Renault 3-ton truck. Instead of four speeds and reverse, only three are now fitted. All plowing is done on second, or direct drive, and road work on the third indirect gear. The main clutch is still a leather-faced cone type. The two lateral clutches, which originally were cone-type lined with Ferodo, are now multiple disk, and are contained in the same housing as the main reducing gears. This is the first time in more than 20 years that Renault has used a disk clutch.

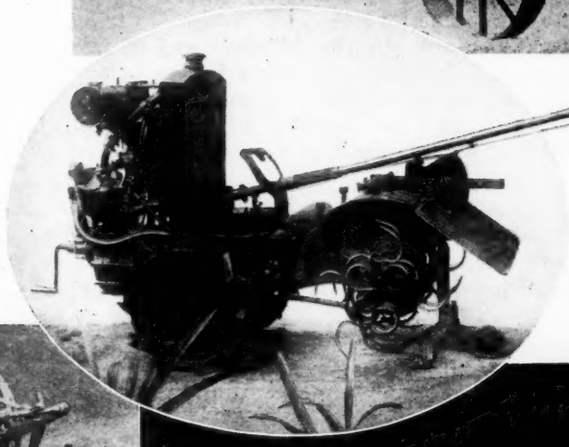
After the first gear reduction by means of spur pinions, there is a second reduction by means of planetaries inside the two main driving pinions. This is the same type of reducing gear as that used within the road wheels of the Renault 7-ton truck. Changes have been made in the frame, which is attached to the tracks by a couple of inverted transverse semi-elliptic springs. The endless bands have been increased in width to 13¼ in. All the rollers within the bands have been modified in order to protect them against dirt, and the grease cups have a diameter of 3 in. The drawbar is placed below the axle, in order to overcome the tendency of the machine to "rear" under certain circumstances, and the main sprockets driving the bands never come in contact with the ground. Total weight of the machine has been reduced to 3 tons. As the result of these changes all working parts are fully protected against dirt and the rollers of the endless bands are made easy to lubricate. It is claimed that mechanical efficiency has been increased 15 per cent.

Peugeot appears to have made no change in his tractor, but has brought out a new plow and a new tow hook. The Tourand-Latil self-contained tractor plow remains unchanged, as does the Delahaye. De Dion-Bouton exhibits two types of cable plowing machines. They are both four-wheel machines, of respectively 30 and 50 hp., with the winding drum mounted centrally and on a longi-

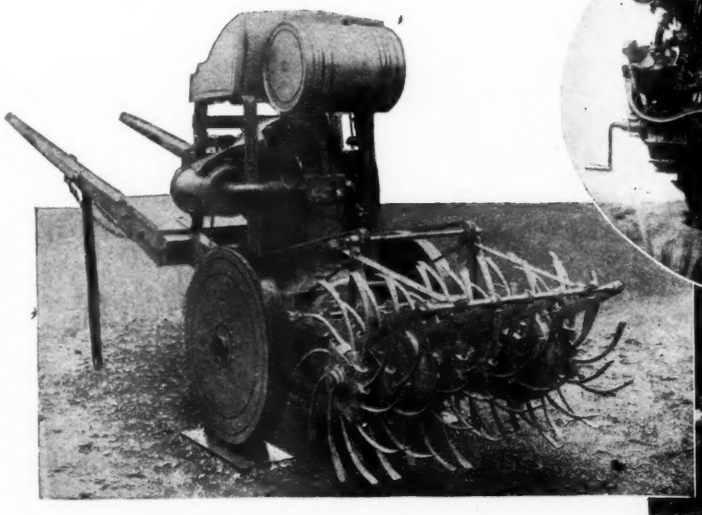
New European Equipment at the Paris Tractor Show



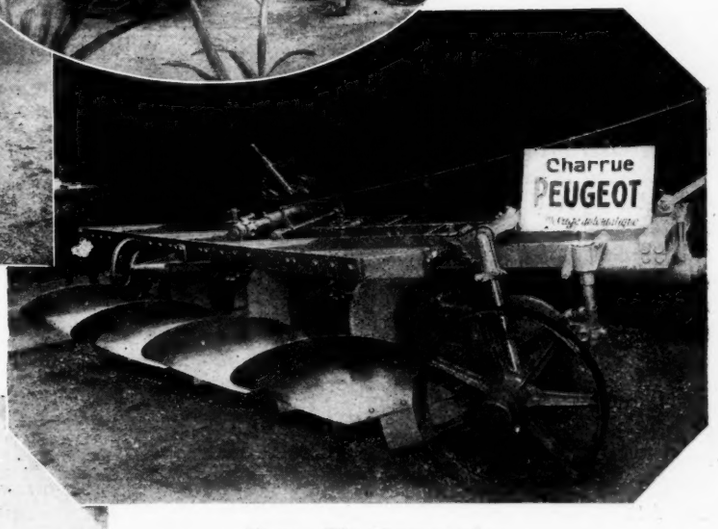
To the right—The Berna tractor is a Swiss product



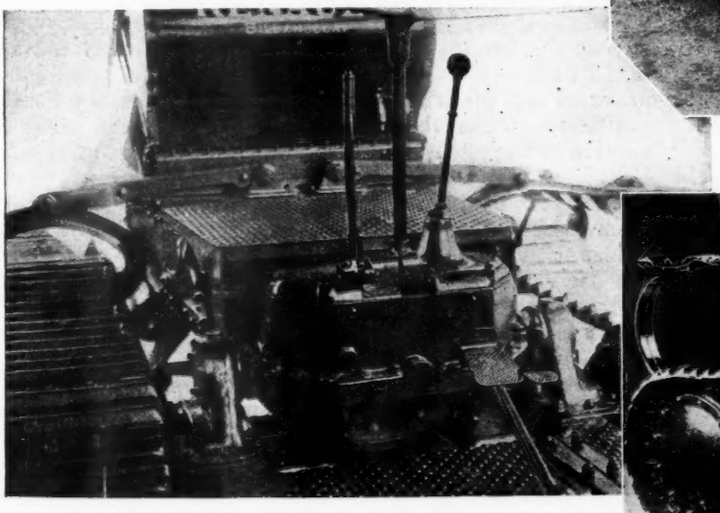
The small Somua rotary cultivator for vineyards



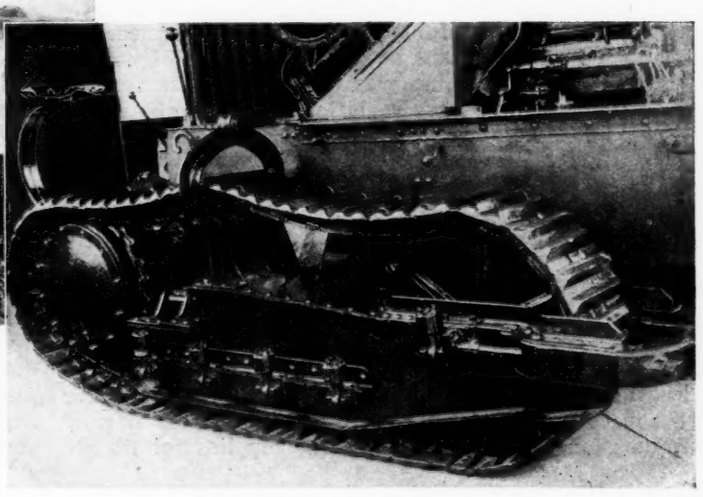
Above—The Petard horse-drawn rotary cultivator. The wheels are a one-piece steel stamping



Above—The Peugeot plow



Above—Rear view of the Renault tractor, showing clutch housing and reducing gears



Right—The endless bands of the Renault tractor. Planetary reducing gears are contained in the driving sprocket

tudinal shaft. Another cable machine is the Doizy, which is also a four-wheeler with central anchorage, and winding drum mounted on a transverse shaft just ahead of the rear axle.

French makers are paying a lot of attention to the narrow track machine for work in vineyards and on small farms. Citroen is just about to produce a machine of this type, but has not yet got it on the market. Another newcomer is the Scemia, an organization connected with the Paris General Omnibus Co. For more than a year this firm has been building the English Saunderson tractor. Its latest production is a narrow-track machine with a total width of 40 in., with driving wheels of 41 in. and steerers of 27-in. diameter. The frame, which is rectangular, carrying in front a two-cylinder, 4 x 6 in. engine, with clutch, gearbox, jackshaft and internal gear drive to the rear wheels, has a trunnion attachment to the center of the front axle, and is suspended by a quarter elliptic spring from the axle to the frame.

René Pétard, formerly engineer to the Mitchell and Lewis companies in America, has brought out a horse-drawn, narrow-track, rotary cultivator for vineyards and plantations. The power plant is a single cylinder, valve-in-head engine, which drives a cross shaft at the rear by means of enclosed chains; the shaft is telescopic, so that the chains work independently. The rotary cultivator is mounted on the shaft or can be replaced by a pulley for driving farm machinery.

The Swiss Berna bears all the marks of the truck manufacturer. It has a 4.4 x 6.3 in., four-cylinder, truck motor, a cone clutch, three-speed gearbox and internal gear drive to the 63-in. driving wheels. The front end is suspended by a transverse spring. The propeller shaft is extended back of the axle and has a 10-in. belt pulley mounted on it. In addition there is a capstan on the rear platform designed specially for forestry work.

Italy's leading contribution is the Fiat tractor, which has taken part in all Continental competitions of the last few months. No changes have been made in its design. The Pavesi machine, built in Milan, is a new type from an old established firm.

The Excelsior, which is the only Czechoslovak contribution, also bears the imprint of the truck manufacturer, for its makers are the Laurin-Klement Automobile Co. The engine is a standard automobile type, 3.9 x 5.9 in., with internal gear drive to the two front wheels. The rear wheel, tracking with the left-hand driver, is the steering wheel.

Record Flight of the L-59

ONE of the most creditable aviation performances during the war was the flight of the Zeppelin L-59 from Bulgaria to Central Africa and back without stop. Not much detailed information about the feat got abroad at the time, but a member of the crew, Hans Schedelmann, recently contributed an article on the flight to the *Illustrierte Motor-Zeitung* of Munich, from which the following is taken.

The task set the L-59 was to carry a 20-ton cargo of hospital supplies, medicines and munitions to the hard-pressed German colonial army of Lettow-Vorbeck. On Nov. 21, 1917, the flight started from Jamboli, Bulgaria, the headquarters of the Zeppelin, at 8:35 o'clock in the morning. At 6:00 p.m. Smyrna was passed, during the night the Mediterranean was crossed, and at 5:15 o'clock the next morning the African shore was reached at Ras Bulau. At 12:30 p.m. the Farafrah Oasis was passed and at 3:15 o'clock the Dachel Oasis. On Nov. 23, at 2:50 a.m., in the neighborhood of Khartoum, the crew received a wireless order from Nauen, Germany, to "Turn about, East Africa occupied." When this order was received, much more than half the distance had been covered.

The return journey also was completed without incident. Assisted by favorable air currents, the cruiser repassed the Farafrah Oasis at 8 p.m. the same night and at dawn the next morning was over the Mediterranean. But enormous temperature variations had to be borne up with. While, on the afternoon of Nov. 23, at an altitude of 8000 ft., a temperature of 79 deg. Fahr. was observed and the crew was sitting at the engines in tropical garments, ten hour later, when the thermometers registered 14 deg. Fahr., fur vests and leather coats did good service. On Nov. 24, at 2:20 p.m., the town of Adalia in Asia Minor was passed. In order to cross the Taurus Mountains, it was necessary to sacrifice some barrels of gasoline. In spite of some rather violent mountain squalls, the airship passed Ishickli at 5 o'clock and Simao at 7:20, and at 11 o'clock at night Constantinople was passed. On Nov. 25, at 8 a.m., the L-59 returned to its landing-place, after a continuous flight of 96 hr., carrying supplies for 80 hr. additional flight. A distance of 4550 miles was covered without stop, which constitutes a record.

Money Is Not the Sole End of Man

THOSE production executives who are prone to believe that money is the only thing affecting the attitude of the workman toward his work will be interested in the following incident which occurred recently in a large Detroit automobile plant.

A certain workman was earning about $8 a day grinding piston pins. Because of a shortage of stock, there were no piston pins to be ground for a time and he was shifted to the task of grinding distributer rods. The average production of a good man grinding distributer rods in that plant is about 175 a day. This man, though new on the job, turned out nearly 300 a day, which netted him a little over $14. Since it is the policy of this plant never to cut piece rates, he was assured that he could continue to earn that money, although, in the general opinion of the shop, the job is preferable to that of grinding piston pins in other ways.

Strangely enough, however, the foreman has had the greatest difficulty in keeping him at work on distributer rods until the stock for his piston pin work shall come in. He would rather lay off for the time being and then go back to his $8 a day, grinding piston pins. The foreman has been unable to discover the reason for his apparently strange desire.

The incident is strange, to be sure, but it is entirely true. Such incidents, though comparatively unimportant in themselves, are practical indications of the fact that many things other than money considerations enter into the attitude of the workman toward his work and his company. As in this case, too it is often difficult to determine the real factors behind such an attitude. In general, they cannot be determined without recognition and a careful investigation. The results of such an investigation would be significant and valuable.

Unit Construction of New Tractor Facilitates Production

Partly assembled and partly of special design, the 3-plow machine of the Magnet company has a worm drive and an unusual type of tangential spoked wheel. Numerous features of its mechanical interest are detailed by Mr. Heldt, who has just completed a trip to numerous tractor factories.

By P. M. Heldt

A 3-PLOW tractor with worm drive and a special type of tangential spoked wheel will be the product of the recently organized Magnet Tractor Co. The machine is partly assembled and partly of special design, the engine being Waukesha and the clutch Borg & Beck, while the transmissions and axles are specially designed and will be manufactured by the concern itself.

The machine is made in three separate units, each assembled by itself, the first comprising the engine or power plant with the clutch, the second the transmission gear and belt pulley drive, which are complete in a single case, and the third comprising the rear axle with its worm drive. The units are independently mounted on a channel steel frame, and any one may be removed without disturbing the others. Flexible couplings are used to connect the engine to the transmission and the transmission to the final drive, these couplings being of a special design. The rear coupling or universal joint has the brake drum incorporated with it. Among the advantages claimed for the unit construction are that it facilitates production in the factory, thus reducing the cost, that it enables the farmer to make repairs or replacements without difficulty and that it permits of using different grades of lubricant in the transmission and rear axle from that used in the engine.

Magnet tractor plowing

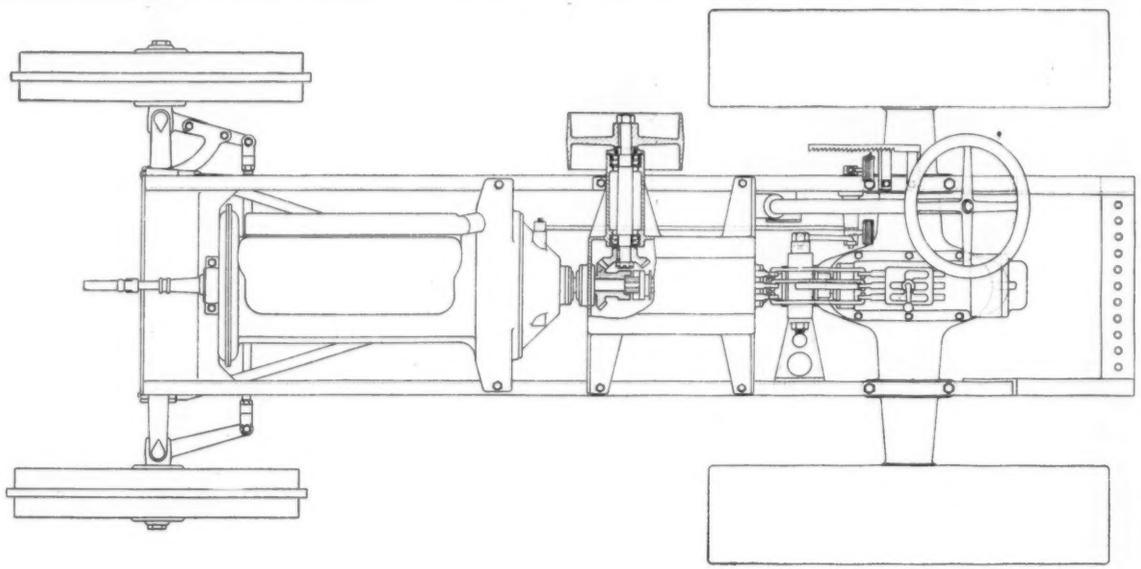
The engine is the Model DU, which has 4½ x 6¼ in. cylinders, and operates normally at 900 r.p.m. A centrifugal governor of the throttling type is built in with the engine and lubrication is by the circulating splash system.

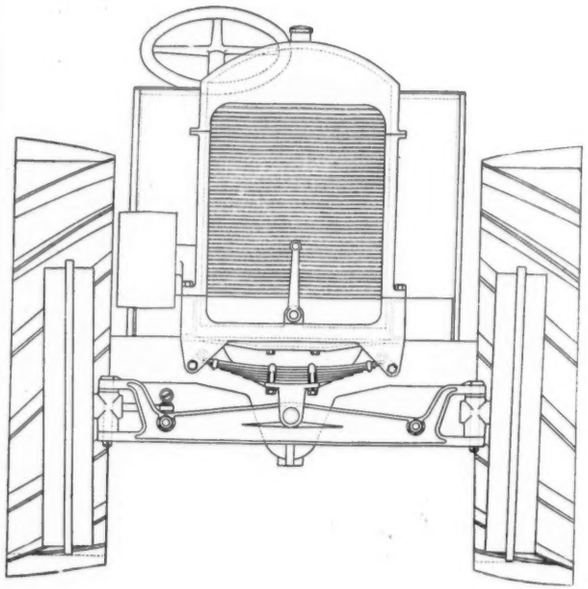
The radiator is of the truck type with cast-iron tanks and side members. The water capacity of the cooling system is 9 gal. The fuel tank is mounted under the engine hood and has a capacity of 20 gal. of kerosene and 5 gal. of gasoline. A Stromberg combination kerosene and gasoline carbureter is fitted, which draws in air through a Bennett air cleaner. Ignition is by a Berling high tension magneto with impulse starter.

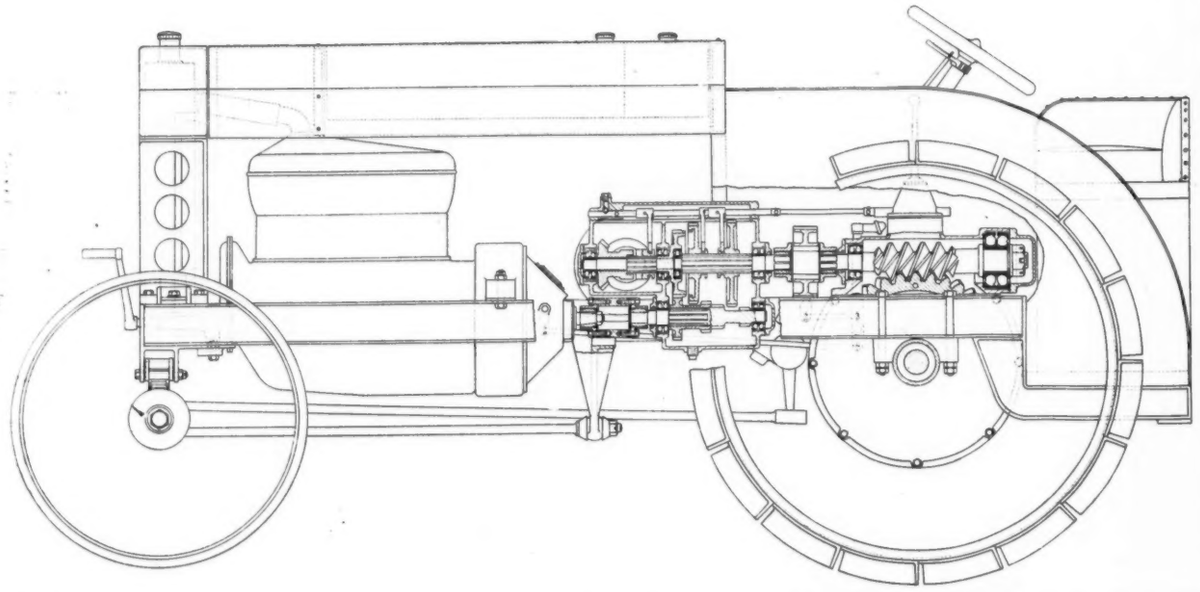
A Borg & Beck heavy type dry disk clutch is used and is enclosed in a housing on the crankcase. This clutch is normally engaged and may be disengaged by means of a pedal. The transmission is of Magnet design, and three forward speeds and one reverse are available, none of these being a direct drive. The primary shaft of the transmission, which is in line with the crankshaft, is located in the bottom of the transmission housing and the secondary shaft above it. All of the pinions on the primary shaft are fastened upon it, and gear changes are effected by sliding the gears on the splined secondary shaft. Of the four pinions on the primary shaft, the most forward one is the high speed, the second the intermediate, the third the low and the fourth the reverse. The gear on the secondary shaft corresponding to the high speed is loose upon this shaft, but can be made fast upon it by sliding the intermediary gear forward. This gear is of larger diameter than the high speed gear and is cut with teeth on the inside of its rim, which permits it to be slipped over a portion of the high-speed gear and thus locks the latter to the shaft. For the intermediate speed, the gear corresponding to that speed is slid into mesh with its pinion on the primary shaft, while another gear on the secondary shaft can be slid into mesh either with a low-speed pinion or the reverse idler gear. With an engine speed of 900 r.p.m. the different tractor speeds are as follows: high, 5 m.p.h.; intermediate, 2.55 m.p.h.; low, 1.8, m.p.h.; reverse, 1.4 m.p.h. All bearings of the transmission, as well as the axle bearings, are of the anti-friction type.

A noteworthy feature of the transmission is the design of the power take-off. It will be seen from the drawings that the belt pulley is located in an accessible position on the right-hand side, sufficiently high to insure belt clearance over the front axle and sufficiently far ahead to obviate interference of the rear wheel with manipulation of the belt. This favorable pulley position is secured, however, at the expense of a double gear transmission of the belt power. Upon a forward extension of the secondary shaft is mounted a bevel gear, running normally free upon the shaft, but provided with one member of a jaw clutch, by means of which it can be locked to the shaft. This bevel gear meshes with a similar one on the power take-off shaft. Belt power is transmitted through the high speed set of gears in the transmission and through the

Three Assembly Views of Magnet Tractor, with Transmission and Drive Shown in Section







bevel gears of the power take-off. Engagement and disengagement of the jaw clutch for the power take-off is effected by means of the gear-shifting lever. The pulley has a diameter of 14 in. x 7 in. face, and runs at 700 r.p.m. when the motor is turning over at 900 r.p.m. The belt speed therefore figures out to 2600 ft. per min.

Final drive is by worm and worm wheel, the latter being 22 in. in diameter and made of aluminum bronze. The worm shaft and the differential are mounted on annular ball bearings, while Hyatt roller bearings are fitted at the outer ends of the axle. A band brake is fitted to act on the drum mounted on the worm shaft; it is actuated by a pedal and is provided with a ratchet locking device. The rear wheels are 48 in. in diameter and have a 12-in. face, the hub being cast with two series of radial lugs instead of flanges, heavy round iron spokes extending through these lugs tangentially and being riveted to the wheel rims. This makes a construction particularly well adapted to take care of the torsional forces set up by the drive. The front wheels are of similar construction and are 34 in. in diameter by 6-in. face. They are provided with ball bearings and dust-proof hub caps.

Steering is effected by means of a worm-and-gear type steering gear completely enclosed and working in a bath of oil. In plowing, the inner wheels run in the furrow and the tractor is said to be self-steering. A comfortable operator's seat with padded back rest is mounted at the right side on the rear platform. All control levers are within easy reach, and the driver from his seat has a clear view of the front wheel and the furrow ahead. Plow levers may be operated from the seat or platform.

The front axle is of I section and the forward end of the frame is carried upon it through a semi-elliptic spring, which is swiveled to the axle at the center and shackled at its ends to spring brackets cast integral with the front cross member of the frame. A wishbone type of radius rod connects the front axle to a cross member of the frame and, together with the swivel connection of axle and spring, permits great flexibility.

The frame is of channel steel, hot riveted and well braced. The tractor has a wheelbase of 90 in. and the following overall dimensions: height, 62 in.; width, 68 in.; length, 142 in. The drawbar hitch is located at a height of 17 in. from the ground and is so arranged transversely that center draft is provided with three 14-in. bottoms, when running in the furrow with the inner wheels. Adjustment of the hitch both laterally and up and down can be made for other requirements. A ground clearance of 14 in. is provided. The weight of the complete tractor is only 4400 lb.

A New Positive Fuel Feed Utilizes a Pulsater Device

A POSITIVE fuel feed by a pulsater system is being offered as an equipment proposition by the Stromberg Carbureter Co. The system operates by pressure which, however, is not applied to the tank, but simply to the line between the fuel pump and the carbureter. The layout of the system will be understood from the diagrammatic drawing herewith, which shows the pulsater, driven by the camshaft of the engine. The pulsater is connected by a copper tube T with the fuel pump and this fuel pump communicates with the fuel tank and the carbureter.

Pressure and suction are exerted alternately by the pulsater and, on the suction stroke, a vacuum is created in the chamber *A*, which is in communication with the fuel tank, allowing fuel to enter this chamber and rise through the strainer to the upper compartment *B*, containing the float *C*. Suction on the chamber *B* allows the light valve *D* to rise, admitting the fuel to the chamber. The lift of this valve is from 0.010 to 0.015 in. As the fuel rises it lifts the float *C*, eventually shutting the pulsater line through contact of the valve *V* with the valve seat. The pressure stroke of the pulsater depresses the valve *E*, sending the fuel through the orifices *F*, and thence to the carbureter through the opening *G*.

For cleaning or inspection, the entire fuel pump is readily disassembled and the strainer can be removed by taking off the cap *H*. In the installation of the device, the carbureter should be located above the fuel pump outlet. Sufficient pressure is exerted on this outlet to raise the fuel to a considerable head and also to replace that used by the engine readily, regardless of the speed. Another necessary point in the installation of the system is that the fuel tank is vented to obtain a flow to the pump on the suction stroke of the pulsater.

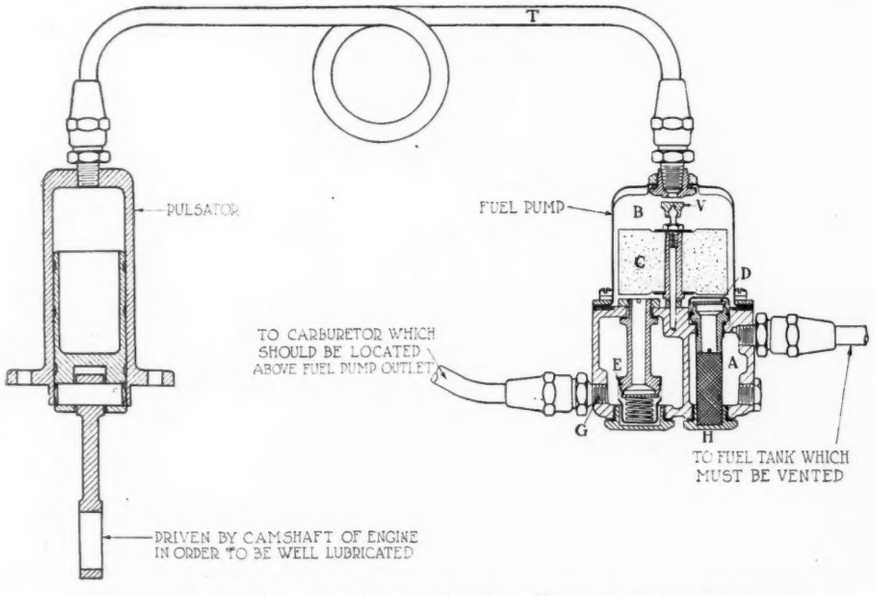


Fig. 1—Installation drawing of the Stromberg fuel system

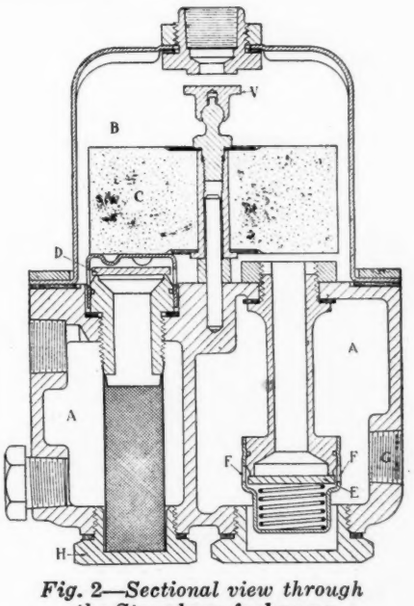


Fig. 2—Sectional view through the Stromberg fuel pump

Preserving the Automobile Finish

At first thought this article might be presumed to belong to the garage. But it really is a manufacturers' problem. A review of several of the instruction books given to car purchasers reveals that not a single one of those looked into gives proper directions for the care of the body finish. One advised the use of "pure soap." Perhaps a neutral soap was meant, but pure soap may be judged from many standards.

By W. H. and E. J. Cole

MUCH thought and experimentation is being devoted at the present time to preserving the automobile finish. This finish is subjected to very severe treatment: Quick changes of temperature on passing from a heated garage to the freezing outside, standing in the snow and rain for hours at a time, mud spattered on the surface and dried on, standing in the broiling sun of a hot summer's day.

As to the finish, most manufacturers give the bodies of their cars several coats of enamel and varnish, brushed or sprayed on, and usually air-dried. Fenders and other metal trim are dipped in tanks of black baking japan, and then baked in ovens at temperatures running from 300° to 450° F. The time required for baking varies from 2½ hours at the lower temperature to ½ hour at the higher. This baking process produces a finish, tougher and more durable than can be produced by air-drying.

Drying of a varnish or enamel proceeds principally by oxidation. This action is rapid until the film becomes hard. It does not stop here, however, but proceeds very slowly throughout the life of the film. In the case of black baking japans, owing to the temperature of baking and materials used in manufacture, namely gilsonite, pitch and certain gums, the drying process is one of polymerization rather than oxidation. With this film there is almost no further oxidation as compared with the other type.

For some time we have thought the methods now in use for cleaning automobiles were very destructive to the finish. The most common method of cleaning is to wash with soap and water, and to dry with chamois. In many public garages, soap containing free alkali is used, which is very bad. Washing every day, also, is more than any finish can stand for long. The man who takes care of his own car, frequently doesn't care to go to the trouble of washing with soap and water, as it is a nasty job at best. He cleans off his car with one of the polishes recommended for automobile use. These may be divided into two classes: (1) The oil polish which consists of an emulsion of mineral oil and water, and usually containing a little soap and alcohol. (2) The wax polish, similar in appearance to ordinary shoe polish, and consisting usually of blends of paraffin and Canäuba wax, thinned to consistency for use with turpentine.

In order to determine the effect on the life of the finish of using these various methods of cleaning, we have made a test extending over a period of six months.

For test pieces, secured six steel plates, 18 in. x 8 in., washed them off thoroughly with benzine, and brushed on both sides and all edges one coat of Fender Black Enamel, as put out by Hilo Varnish Corp. This is an elastic, air-drying black enamel, which sets dust-free in four hours and dries hard overnight. These plates were allowed to dry three days, after which they were rubbed lightly with pumice stone and water. Then three plates were brushed with one coat of Hilo Quick Finishing Varnish, which we will call A. The other three were finished similarly with Hilo Body Finishing Varnish, which we will call B.

After drying seven days, these were exposed on the roof. Once each week these panels were cleaned and inspected. 1-A and 1-B were washed simply with water and neutral soap; 2-A and 2-B were dusted off and polished with one of the regular automobile oil polishes, as put out for the automobile trade; 3-A and 3-B were dusted, and polished with a popular automobile wax polish.

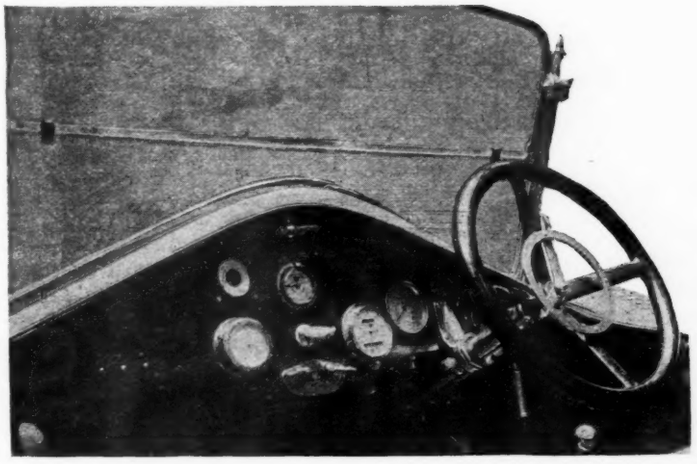
For the first four months very little change in the durability of the finish could be seen. Immediately after cleaning, panels 2-A and 2-B, treated with the oil polish, had the best appearance, but in 24 hours, owing to the fact that they had gathered more dust, they didn't look as good as the others. Panels 3-A and 3-B, treated with the wax polish, were second best in appearance, although they were slightly spotted from raindrops. The wax alone would not remove these. Panels 1-A and 1-B were not as bright after cleaning as would be expected. Although a few marks showed where they had been rubbed, the finish was O. K.

Five months' weathering showed some striking changes. Panels 1-A and 1-B had the best appearance. Panels 3-A and 3-B, although slightly spotted and mottled, were better looking than 2-A and 2-B, both of which showed many fine cracks.

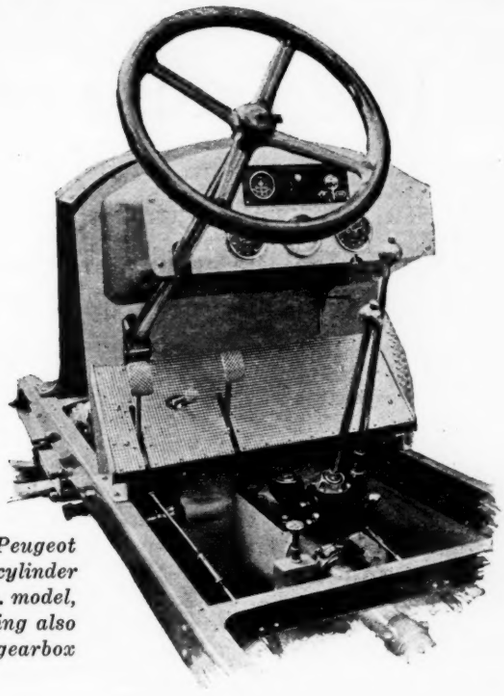
After six months' exposure, panels 1-A and 1-B showed up decidedly the best. The luster was good and the finish showed no cracks. Panels 2-A and 2-B had cracked worse and worse until they were a mass of fine cracks, which gave them a flat, dull appearance. 3-A and 3-B showed many fine cracks, but did not show up as bad as 2-A and 2-B. In every case the results secured with one varnish paralleled those secured with the other.

From these tests we conclude that washing with soap and water is the best method of cleaning. It has been claimed that the use of oil and wax polishes lengthened the life of the finish, owing to the thin film of oil and wax left on the surface. This film is supposed to retard and prevent oxidation of the varnish beneath. This theory is completely exploded.

A Study of Continental Dashboards

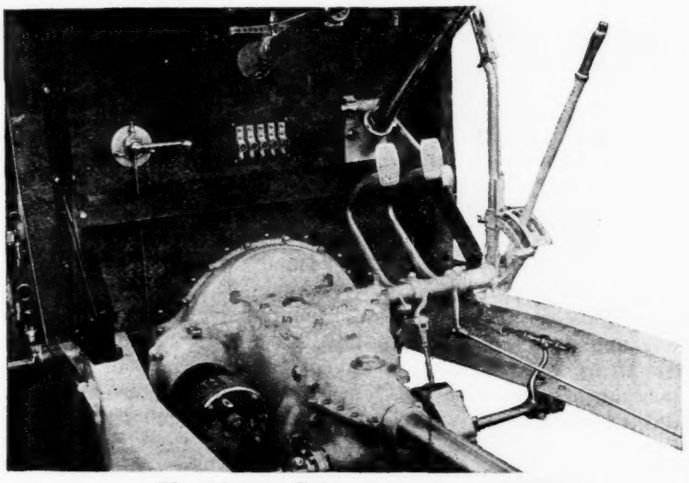


The well-filled dashboard of the new Picard-Pictet

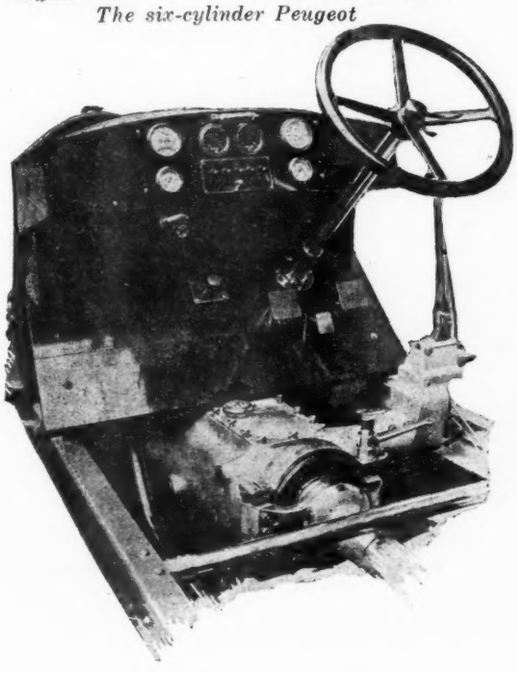


The Peugeot four-cylinder 10-hp. model, showing also the gearbox

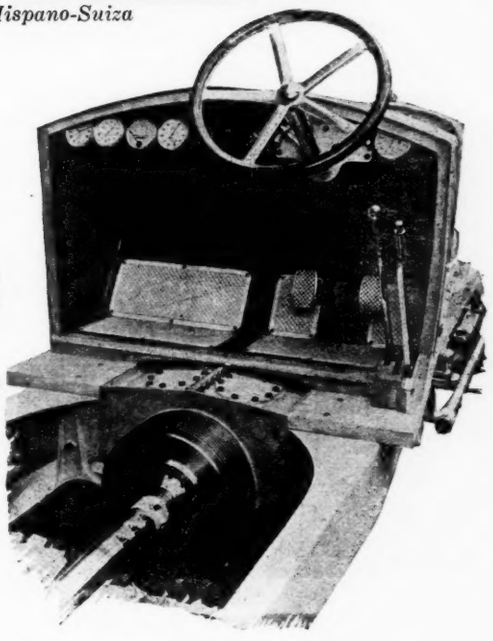
The six-cylinder Peugeot



The Hispano-Suiza



To the left—The gearbox and dashboard of the Spa



To the right—The Gnome & Rhone

The Cause of Static Phenomena on Ignition Cables

How the ground or return circuit, if close and parallel to an active cable, traps the stray lines of force that otherwise would affect the neighboring cables. Theory and practice in guarding against static troubles.

By Harry F. Geist, E. E.

IT is well known in ignition practice that the high voltage impulse of electrical energy which initiates the spark at one of the spark plugs, will under certain conditions leave an electrical charge called "static" clinging to the circuit after the spark proper has been delivered, or it may cause a transfer of energy to other neighboring circuits by induction. The electrostatic effect may arise in multi-cylinder engine ignition installations where the cables used parallel each other for a considerable length and it may be sufficient to seriously interfere with ignition, unless special precautions are taken.

The purpose of this article is to discuss briefly the general nature of electrostatic phenomena, in order to bring out the underlying principle of the grounded metal tube which is now very generally used to protect the cables both mechanically and electrically.

Let us first consider the high tension ignition system and the electrical impulses to which it is subjected during operation, touching only upon those phases affecting static phenomena.

In Fig. 1 is shown diagrammatically a high tension magneto ignition system distributing to four spark plugs. This diagram shows the primary winding, condenser and breaker, each grounded to the armature core representing the primary or generating circuit. The secondary circuit also starts from the armature core and feeds to an insulated collector spool and thence to the distributor, which makes the proper connections with the spark plugs through four insulated cables. The secondary ground or return circuit includes the engine and magneto frame and in addition a grounded tube which carries the cables.

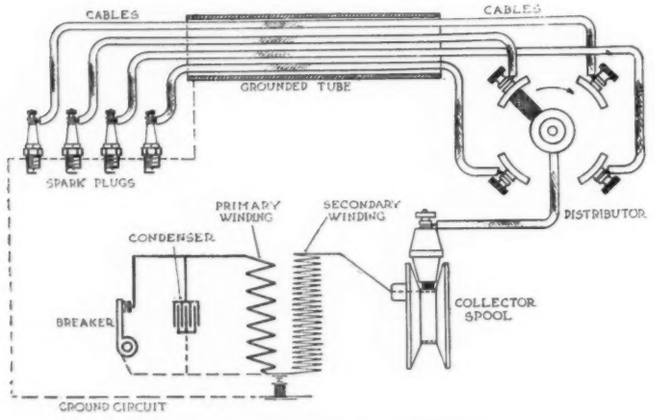


Fig. 1—Circuit diagram for high-tension magneto ignition system with 4-cylinder engine

From the figure it is seen that the distributor can only connect one spark plug circuit directly with the magneto at any one time. Also, that the other three cables are open circuited both at the spark plug and the distributor and are so paralleled to the "acting" cable that if their parallel lengths are sufficient in any case, induction, as hereafter described, may take place to such a degree that trouble will result. Other secondary circuit conditions will be pointed out in the course of the discussion.

Fig. 2 shows graphically the impulses of electrical potential to which the secondary circuit is subject during sparking. The sequence of events is indicated by the arrow.

During the period when the breaker is closed, generating and storing the energy for the spark, the potential generated in the secondary circuit is negligibly small, so that the instant of interruption of the primary circuit is taken as the logical starting point. Following this instant, a very high potential is set up in the open secondary circuit, almost instantaneously reaching a value sufficient to cause an arc-over at the spark plug and starting the spark. As the spark current starts to flow across the spark gap the potential, of course, drops off to what is shown as the spark voltage, the variations being due to oscillations of electric energy between the primary winding and the condenser. After from 0.003 to 0.005 second, the energy becomes spent in the spark to such a degree that the spark current suddenly ceases and induces the voltage peak indicated by "discontinuation of spark," after which the voltage drops off to nearly zero.

Following the cessation of the spark, the primary breaker again comes to a close, short circuiting the primary winding. But inasmuch as it closes under the action of a spring, its closing is usually characterized by a few vibrations, each of which interrupts an incipient

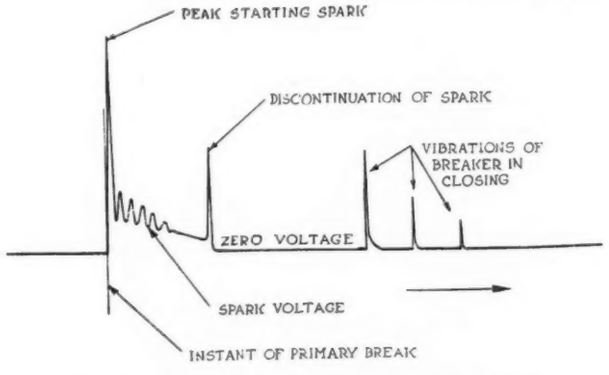


Fig. 2—Voltage impulses in secondary circuit during the sparking phenomena

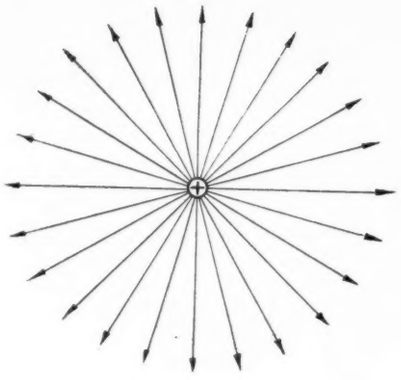


Fig. 3—Electrostatic charge established on isolated cable

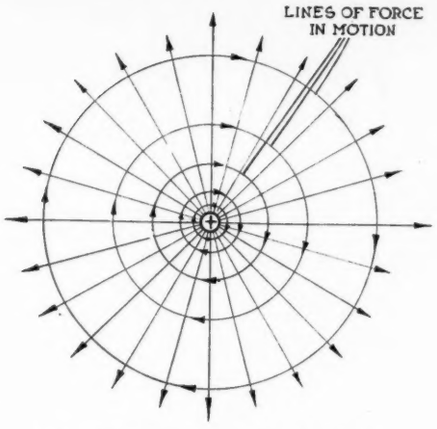


Fig. 4—Process of charging isolated cable during the establishment of high potential

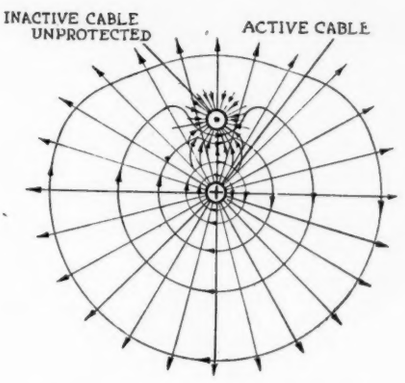


Fig. 5—Charging of neighboring cable by induction during energization of active isolated cable

energy generation in the primary circuit, and consequently produces a series of secondary circuit voltage "kicks."

The principal thing the writer wishes to point out in Fig. 2 is that a series of voltage impulses follows the break of the primary circuit, until it is finally completely closed again. These impulses are usually of the same polarity for any one spark, as shown, and occur over a period of time equal to two or more times the duration of the spark itself.

It is these voltage impulses that give rise to the "static effect" that may cause trouble. But before attempting to analyze the troubles which may arise under certain conditions from the impingement of these impulses upon the secondary circuit or to investigate methods for protecting the circuit, let us first consider the general nature of static electricity.

When a relatively high potential is impressed upon an open circuit, four results follow—namely:

1. The circuit takes on a charge of electro-static energy, due to a certain distributed capacity for this energy which exists between the circuit parts subjected to the potential. This charge will seek parts of the circuit where the capacity is the greatest and will also gather at any sharp ends or points on the circuit.

2. During the very brief period of time required for this charge to become established, induction takes place, energizing neighboring cables which happen to be within range of this rapidly building up charge. Such an electro-static charge in an ignition circuit requires 0.00001 second or less to build up, so that while this form of energy is usually called static it is most certainly dynamic until established.

3. After such a charge has been established, it may cling to the circuit long after the force or voltage which produced it has been removed, unless a leakage path exists.

4. The circuit insulation of the cables, etc., cannot be perfect, and some energy, however slight, will leak.

It is well to point out at this time, inasmuch as both the factors of capacity and insulation are of consequence, that there is no means of insulating against the establishment of an electro-static field any more than it is possible to insulate against magnetism. However, the quality of the insulation and its possible leakage allowance may affect very materially the amount of the electro-static charge that can be established, and determine how long the charge will cling to the circuit after the potential is removed.

Fig. 3 is intended to represent an isolated cable in which an electro-static charge has been induced. By the term "isolated" is meant a cable so distant from its return circuit, toward which all the lines of force extend, that the field immediately surrounding the cable will be practically uniform. This field extends outward from the cable in every possible direction, just as light would radiate from it.

As was pointed out, this stress may exist with the potential that produced it or may exist upon the cable after the potential is removed. This stress represented diagrammatically in Fig. 3 is a form of stored energy, and as energy it requires time either for its establishment or for its dissipation.

It has been found that such a charge of electro-static energy can be expressed by the equation

$$Q = CE \qquad (1)$$

where Q is the quantity of electricity, C, the distributed capacity, and E, the potential required to establish the stress.

It is also well known that Q is the product of current and time, so that equation (1) can be written in the form

$$Q = IT = CE \qquad (2)$$

From these equations it is evident that the voltage does not actually exist in a circuit until the charge has been established. Furthermore, it must also be apparent that for a circuit having a non-uniform distribution of capacity, the potential due to the establishment of a charge may mean a much higher potential for one part of the circuit than another.

From the fact that current and time are required to establish an electro-static field we can derive the equation

$$i = C\,\delta e/\delta t \qquad (3)$$

in which i and e represent instantaneous values of current and voltage.

Equation (3) shows that for a circuit in which the voltage builds up over some period of time, the current will at any instant be directly proportional to the amount of the capacity and to the rate of voltage change.

From equation (3) the power represented in the establishment of the field can be expressed by

$$p = ei = CE\,\delta e/\delta t \qquad (4)$$

and the energy represented in the charge by

$$W = C\,e^2/2 \qquad (5)$$

This energy equation shows that the amount of energy represented is proportional to the square of the voltage. This means that in the case of two spark plugs being set so that the voltage required to produce a spark at one is twice as much as at the other, the corresponding energy charge necessary will be four times as much.

In order to show how the energy builds up according

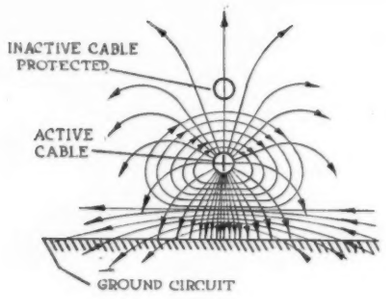


Fig. 6 — Proximity of ground circuit distorts field and protects neighboring cable

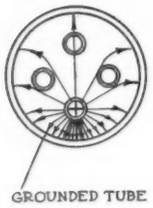


Fig. 7—Cables carried in grounded metal tube, which eliminates inductive effects

to equation (3), diagram Fig. 4 is shown. In this figure the same radial lines shown in Fig. 3 represent the charge already established, while the ring lines of force are set up by the current i and are expanding and moving outward at a very high rate of speed, adding energy to the charge. It is the motion of these lines of force traveling outward at a very high rate of speed that induces charges in neighboring cables.

This phenomenon known as induction is represented in Fig. 5 which shows how the circular lines of force in moving outward have to cut across the neighboring cable, inducing current flow and building up a static charge of opposite polarity from that being established on the acting cable. While these current forces are not as powerful as those accompanying purely electro-magnetic phenomena, induction takes place at greater distances.

Thus it is seen from Fig. 5 that a parallel neighboring cable, while it may have no metallic connection with an active cable, may become energized by induction. The amount of the energization of the neighboring cable will depend upon the amount of the force energizing the acting cable, the rate of energization, the proximity to the acting cable and the distance to which the cables are parallel. This is under the assumption of the "isolation" condition as illustrated in Figs. 3, 4 and 5.

When the ground or return circuit is close to the acting cable, the conditions are changed considerably and may serve as a shield against induction in parallel cables.

This condition is illustrated by Fig. 6. The return circuit for the radial lines of force being now very close to the cable, most of the lines of force will take the shortest possible path and the charge will therefore be concentrated on one side of the cable. The capacity of the cable is also increased so that the amount of charge will be greater.

During the establishment of this distorted field, the circular forces traveling outward are limited in their scope to a distance roughly one-half the distance between the cable and ground. Furthermore, these circular lines of force will be very much reduced in strength on the side opposite the ground, so that a neighboring parallel cable located as the inactive cable as shown in Fig. 6, is shielded from inductive effects. If the neighboring cable was so located that it came between the acting cable and its ground circuit, it would also be in a shielded zone, because the circular forces moving outward from both the acting cable and the ground circuit meet at a neutral plane where induction is practically impossible.

Induction therefore takes place, it is seen, under the conditions where the circular lines of force move outward and cut across neighboring cables at a high rate of speed.

The shielding effect of a distorted field, as caused by the proximity of the ground circuit, is the underlying principle of the grounded metallic tube and explains why the inductive effects are reduced when such a tube carries the cables.

Fig. 7 shows such a tube carrying four cables and illustrates how the field set up on the acting cable will be most dense on the side nearest the tube, allowing very little of the electro-static energy to act upon the other three cables.

The principal function of the grounded tube from an electrical standpoint is that of shielding the neighboring parallel cables from the inductive effects that would otherwise accompany the energization of the acting cable. The tube, however, cannot eliminate the static charge that may tend to cling to the acting cable after the spark has been delivered, unless it does so by increasing the leakage, in which case it might be as much of a disadvantage as an advantage.

However, the elimination of induction in the case of four parallel cables, for example, reduces the number of electrical charges that any one cable will be subject to, to only twenty-five per cent and that ought to be of considerable aid in the elimination of static trouble.

There seems to be very little data available upon the effects of induction on parallel cables as employed in high tension ignition systems; neither does there seem to be any classification of the troubles which might arise from electro-static charges, either clinging to or induced upon cables, in terms of the conditions permitting them. It has, however, been the writer's experience that these troubles are of an intermittent nature; sometimes they give engine trouble and sometimes not and when they do it is usually of such irregularity that analysis is very difficult. Static electricity is also influenced very much by climatic conditions, the charge leaking away very rapidly where there is dampness. However, the only two engine troubles that can arise from static effects are pre-ignition and misfiring.

In the operation of a high tension magneto ignition system, every other spark in turn is of opposite polarity, so that in case a residue positive charge was left upon a cable after the spark was delivered, it would follow that in the case of conditions permitting considerable induction, the next negative spark would induce a positive charge or series of charges which would add to the original residue charge, perhaps building it up to such an extent that one of the voltage kicks would be sufficient to cause it to jump over at the spark plug. It may require a number of sparks to finally build the static charge to a sufficient value to cause trouble; it may not always jump over at a time when trouble will result, but the fact that such a charge can be accumulated and discharged at almost any time makes it certain that pre-ignition will at times result.

Conditions in the circuit may be such that a negative charge may accumulate upon a cable. When this cable is ready to be energized for the delivery of a positive spark, the negative charge will first have to be neutralized before the positive charge can be established. Under certain conditions, the system may not have sufficient power to perform this double duty in starting the spark, and the result will be that the system will misfire.

Inductive effects usually become of consequence in ignition systems where long cables are used. Long cables should be avoided as much as possible, because their large distributed capacity calls for an electro-static charge at the starting of the spark that may be an excessive burden and sufficient to cause some weaker magnetos or battery systems to fail entirely. In addition, the amount of energy leakage increases in proportion to the cable length, meaning an additional drain on the energy available for the initiation and completion of the spark.

Figs. 8 and 9 show some very simple but interesting

experiments revealing the presence and something of the nature of static effects.

In Fig. 8 is shown a spark plug at which a spark is being produced under atmospheric pressure. The gap is widened about as much as the system will stand. By bringing the metal end of a screwdriver or other tool into the field of the spark, it will be found that the spark can be teased into jumping a greater distance than it normally would. This phenomenon occurs when the conditions of the discharge points are the same in both cases and is due entirely to a static effect.

The metal screwdriver has a certain capacity, and when brought into the field it becomes charged by induction, so that a certain independent potential is set up between the screwdriver and the spark plug. This potential adds to the spark producing potential across the spark plug gap, so that an easier path for the spark can thus be established for the spark by a longer route.

In Fig. 9 the screwdriver is held close to the high potential point of the spark plug but sufficiently distant from ground not to come within the path of the dynamic spark. In this case the screwdriver will again be charged by induction and a static charge will jump over to the screwdriver. This discharge of static electricity relieves the spark plug and cable, and indicates the amount of charge and the potential force it has.

The method of relieving static charges illustrated in Fig. 9 is made use of in what is known as the standard three point test gap, now in general use by magneto manufacturers in their test work. The same principle

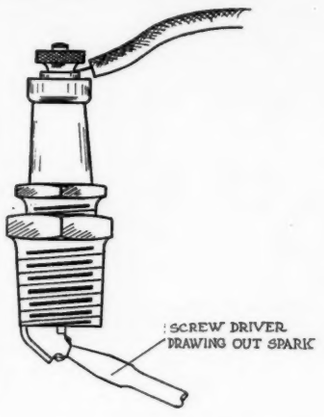


Fig. 8 — By drawing out spark, screw-driver shows presence of static electricity

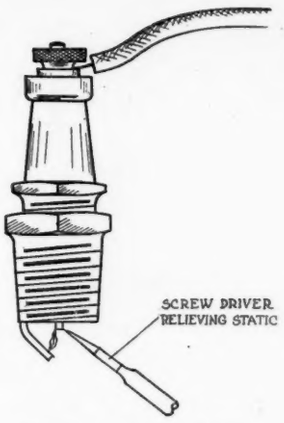


Fig. 9 — Screw-driver relieving static condition

might be employed to relieve the static charge on an ignition system while in operation on an engine. Another method of relieving static charges would be a rotating grounding device incorporated in the distributor. This method would no doubt be the most effective.

But the grounded tube, offering as it does a mechanical as well as an electrical protection to cables, being inexpensive and not subject to any wear or other mechanical troubles, has been generally adopted as the standard method for cable protection.

MP, a Factor of Merit of Internal Combustion Engines

THE use of the factor *MP* (mean pressure) as a criterion of merit for internal combustion engines is recommended by Herman Lemp in an article in the *General Electric Review*. This factor has been used by other writers under the name "brake mean effective pressure" and is equal to the mean effective pressure during the power stroke multiplied by the mechanical efficiency. Lemp shows that the value of this factor can be readily determined from the results of brake tests and the cylinder dimensions, speed of rotation and number of cylinders of the engine. For instance, the equation for a multiple cylinder four-stroke cycle engine would be

$$\frac{s \times d^2 \times n \times N \times MP}{1{,}000{,}000} = BHP$$

where s is the length of stroke in inches
d, the cylinder bore in inches
n, the revolutions per minute
N, the number of pistons.

A similar formula can be used for two-stroke cycle engines, the only change being the addition of the multiplier 2 in the numerator of the fraction, which is due to the fact that for a given speed of revolution there are twice as many power strokes per minute.

Starting with the well-known formula for the brake horsepower of a double acting steam engine

$$\frac{PLAN}{33{,}000} = HP$$

and, taking into account the fact that in a four-stroke cycle internal combustion engine there is only one power stroke in every four strokes performed by the piston and the piston is acted upon only on one side, we arrive at the following correct formula for the horsepower:

$$\frac{3.14}{4 \times 12 \times 33{,}000 \times 2} \times s \times d^2 \times n \times N \times MP$$

which reduces to

$$\frac{1}{1{,}008{,}403} \times s \times d^2 \times n \times N \times MP$$

The numerator in the above fraction differs from 1,000,000 by less than 1 per cent and for ordinary purposes it is sufficiently accurate to use the denominator 1,000,000. The equation can then be transformed to read

$$\frac{s \times d^2 \times n \times N}{1{,}000{,}000} = \frac{BHP}{MP}$$

Mr. Lemp lays particular stress on the value of *MP* as a characteristic for comparing engines of different design. A high *MP* is an indication that both the indicated horsepower for a given displacement is high and the internal friction is low, hence a large brake horsepower is developed.

For instance, Diesel engines have a very high mean effective pressure, but the mechanical efficiency is low as compared with automobile engines of the constant volume type. For this reason the *MP* of the Diesel engine is only slightly larger than that of an engine of the constant volume type, the value usually being between 70 and 84 lb. per sq. in. Aircraft engines, on the other hand, show an *MP* of 100 to 105 lb. per sq. in., which is due to the combination of high thermal efficiency with a high mechanical efficiency.

The Design and Construction of the 183 cu. in. Engine

Part II

The final instalment of the article begun in the issue of last week; this takes up the commercial use of the 3-liter engine. The writers predict that the overhead valve will become prominent and present the engineering side of this interesting problem, showing its necessary study and problems.

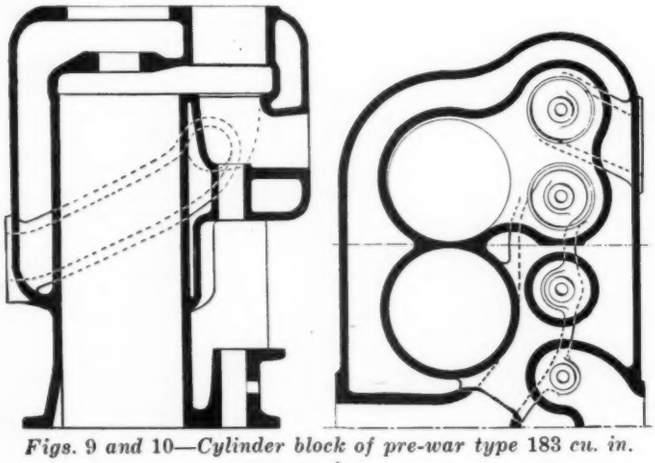
By S. Gerster and W. F. Bradley*

RACING undoubtedly has influenced considerably the development of the 183 cu. in. engine for passenger car service. From 1909 the size of engines has steadily decreased and, at present, in France and England, the average engine size is less than that figure. This, of course, is due in considerable measure to the system of taxation on horsepower and to the high cost of gasoline. The outcome is that in all European countries it is considered possible to get out of an engine not exceeding 183 cu. in. all the power required for a full-sized passenger car. Cars are built with a larger cylindrical capacity, but in such a small minority that they may be classed as luxury machines only.

The racing experience with overhead valve engines undoubtedly will make itself felt commercially within a short time. European makers, as a whole, are not ready for the 183 cu. in. overhead valve engine for passenger cars but it appears to be the type of construction they soon will adopt. The L-head type is a good compromise; it is cheap to build and it holds the field for the present, and it is in connection with these only that accurate data can be given.

Two engines may be taken as typical of European construction in this class. One is the 183 cu. in. engine designed in 1913 and in regular construction since that date; it develops 43 hp. The other is a post-war type, 80 x 149 mm., having the same cylindrical capacity, but developing 48 hp. Both are of the L-head type, and are designed for the regular market.

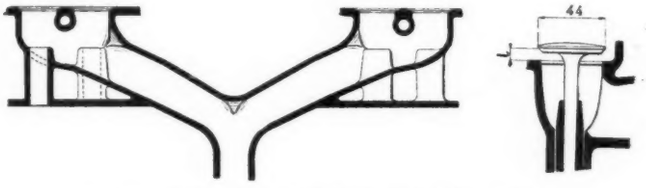
*Mr. Gerster is an eminent French automotive engineer and Mr. Bradley is European correspondent for AUTOMOTIVE INDUSTRIES.



Figs. 9 and 10—Cylinder block of pre-war type 183 cu. in. engine

The pre-war 85 x 132 mm. engine ran at 1950 r.p.m. and developed 43 hp. Its piston speed was 8.6 meters/second (1690 ft. p.m.) and the volume of mixture aspired 68 liters/minute (4149 cu. in.). The compression was 4.3 kilos (61 lb). The form of the combustion chamber is shown in Figs. 9 and 10. The engine is equipped with a carbureter of 30 mm. and the gas velocity at the car carbureter outlet is 69 meters/second (13,550 ft. p.m.).

The intake manifold is shown in Fig. 11. The section of this pipe increases progressively as it reaches the



Figs. 11 and 11-A—Intake manifold and valve

valves. The intake piping is completely surrounded by the water jacket, thus thoroughly warming the mixture, tending toward good carburetion and preventing condensation in the manifold. In winter this has been found satisfactory. The cylinder casting is made rather more difficult by the passage of the intake manifold between the valves and the cylinders. Cheaper construction is possible by mounting the carbureter on the valve side of the engine and for summer service such an arrangement is preferable.

Intake Velocity

The gas velocity (Fig. 11-A) in the intake valves of this engine is 68 meters/second (23,400 ft. p.m.), and in the exhaust valves 62 meters/second (12,200 ft. p.m.). In more modern engines, the same valve lift is given for the inlet as for the exhaust valves and in aviation engines the gas passages are the same for the intake as for the exhaust. The valve springs have been calculated as follows:

$$P = 1.2\,\frac{Dm^2 \times \pi}{4} = \frac{1.2 \times 4.4^2 \times 3.14}{4} = 18 \text{ kilos.}$$

The timing is as follows:

Exhaust opens 44 deg. before lower dead center.
Exhaust closes 2 deg. after upper dead center.
Intake opens 4 deg. after upper dead center.
Intake closes 20 deg. after lower dead center.

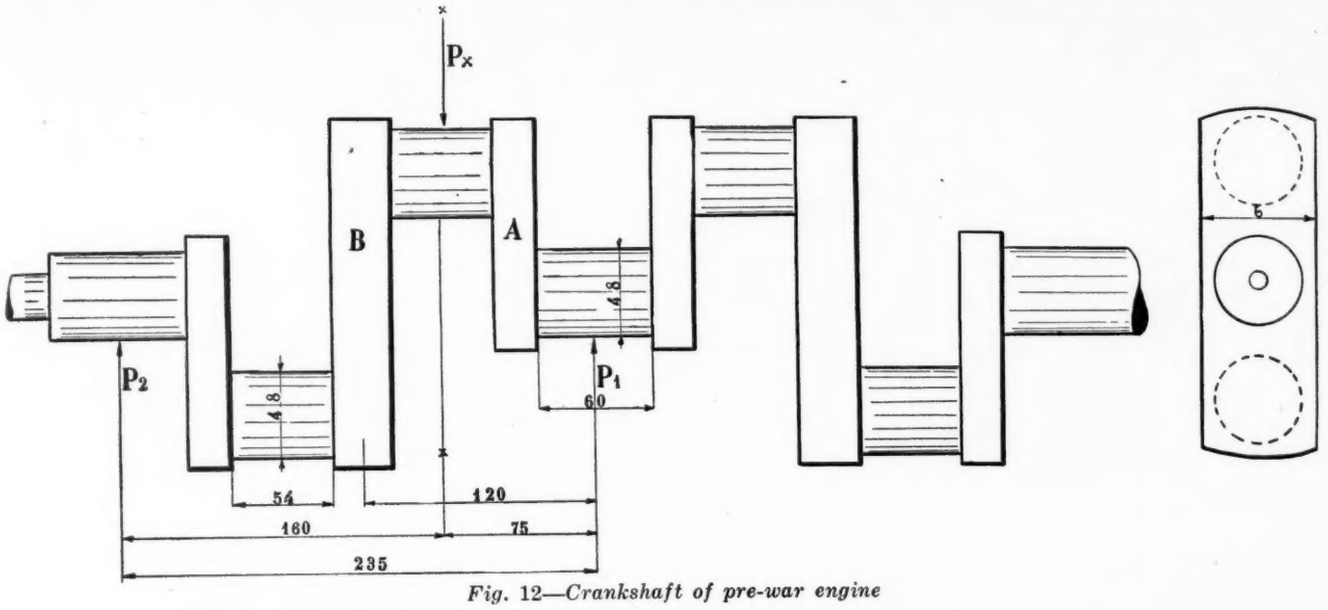


Fig. 12—Crankshaft of pre-war engine

The crankshaft (Fig. 12), which is mounted in three bronze bearings, is of steel, hardened, heat-treated and ground. However, this type of construction has given way to forged shafts with white-metal lined bearings.

The explosion pressure is

$$P = S \times P_x = 56.74 \times 25 = 1400 \text{ kilos.}$$

P_x is taken rather higher than the actual figures to avoid the danger of a weak shaft.

$$P_1 = \frac{P_x \times 160}{235} = 950 \text{ kilos.}$$

$$P_2 = \frac{P_x \times 75}{235} = 450 \text{ kilos.}$$

The moment of resistance above P_x is

$$M = P_1 \times 75 = 950 \times 75 = 7100$$

The crankshaft has a diameter of 44 mm.

At this section the metal is loaded

$$S = \frac{M}{W\,48} = \frac{7100}{1085} = 7 \text{ kilos.}$$

The web has a section of 24 x 54

$$M = P_1 \times 4 = 950 \times 4 = 3800$$

$$S = \frac{M}{W} = \frac{M}{\frac{b \times h^2}{6}} = \frac{3800}{6.10} = 6.2 \text{ kilos per sq. mm. (8800 lb. per sq. in.)}$$

The web has a section of 32 x 54

$$M = P_2 \times 12 = 450 \times 12 = 5400$$

$$S = \frac{M}{W} = \frac{5400}{1100} = 5 \text{ kilos (7100 lb. per sq. in.)}$$

Experience has shown that this shaft is just sufficient with steel having a resistance of 50 kilos per sq. mm. (71,100 lb. per sq. in.).

The pressure per square centimeter on the main bearing surfaces are:

Connecting-rod bearings:

$$P = \frac{P_1}{F} = \frac{1400}{4.8 \times 5.4} = 54 \text{ kilos per sq. cm. (768 lb. per sq. in.)}$$

Main bearings:

$$P = \frac{P_1}{F} = \frac{950}{4.8 \times 6} = 32 \text{ kilos per sq. cm. (455 lb. per sq. in.)}$$

The piston pin (Fig. 13) is loaded as follows:

$$M = \frac{P_x}{2} \times \frac{b}{2} = 700 \times 3.5 = 2450$$

$$S = \frac{M}{W} = \frac{2450}{572.6} = 42.5 \text{ kilos (602 lb. per sq. in.)}$$

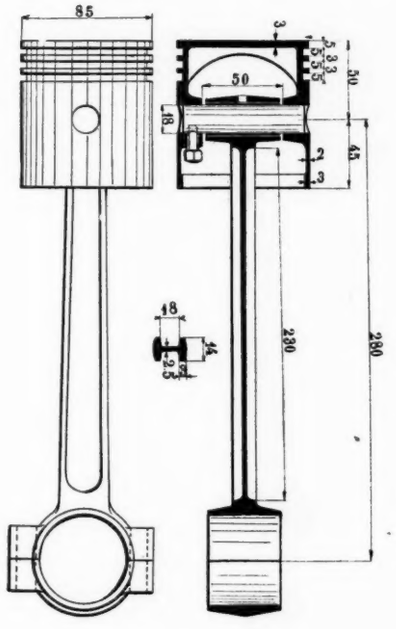
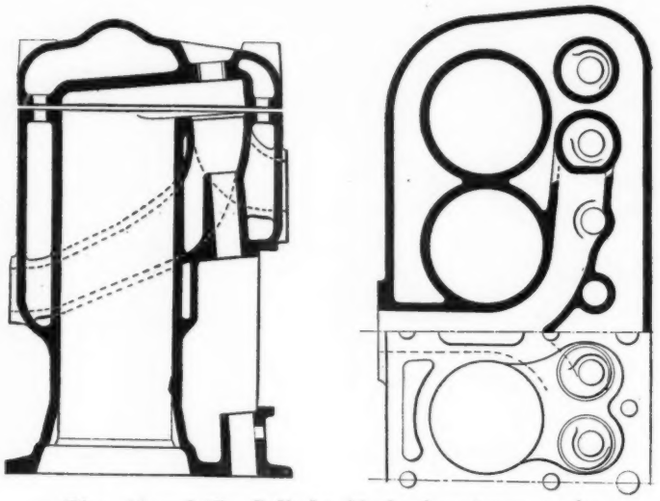


Fig. 13—Piston and connecting rod of pre-war engine

The connecting rod (Fig. 13) is a mild steel forging, loaded to 10.8 kilos under compression and having a factor of safety of 4.8 under flexion by compression.

$$M = \frac{\pi^2 \times T \times E}{6_2 \times P_x}$$

Lubrication is under pressure, by a gear pump driven by helical gears off the camshaft. The pump delivers 9 liters per minute (2.3 gal.). The gears have 10 teeth, module 3, and a height of 25 mm. The pump runs at 570 r.p.m. A relief valve returns the excess oil to the base-chamber and pressure is 300 grammes per sq. cm. (4.25 lb. per sq. in.).



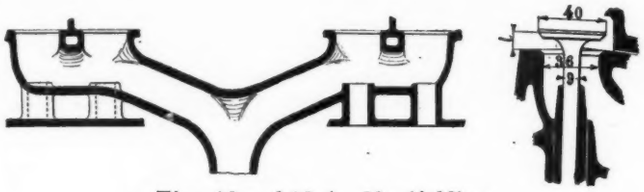
Figs. 14 and 15—Cylinder block of post-war engine

Cooling is by thermo-syphon, the interior diameter of the pipes being 50 mm. (2 in.). Camshaft drive is by chain. This type of drive, however, is tending to disappear, owing to the various inconveniences of the chain and because of the progress made in the cutting of helical gears.

The second engine, which is of more recent construction, has a bore and stroke of 80 x 149 mm. and develops 48 hp. at 2000 r.p.m. A comparison of the values given makes it possible to secure a good idea of the progress made during the last six years. The piston speed has been increased to 9.9 meters/second (1955 ft. per m.). The volume of gas aspired per horsepower-minute is 63.5 liters (3874 cu. in.). The compression is 4.8 kilos (68 lb. per sq. in.).

Removable Head in Recent Design

Figs. 14 and 15 show the shape of the combustion chamber. One of the changes has been the adoption of the detachable head which was taken up by French engineers after America had shown the way. The change facilitates foundry work and machining. The valves are inclined to give a more compact form of combustion chamber and a better passage of the intake pipes. The mean effective pressure is 7.2 kilos (102.4 lb. per sq. in.); and the horsepower per liter of cylinder volume is 16.



Figs. 16 and 16-A—Manifolding

The gas velocity at the carbureter outlet is 71 meters/second (14,000 ft. p.s.). Between the exhaust valve guide and the cylinder the speed is 63 meters/second (12,350 ft. per m.); between the inlet valves it is 61 meters/second (12,000 ft. p.m.) and below the valve it is 45 meters/second (8850 ft. p.m.). This gas passage, as shown in Figs. 16 and 16-A, is too big, but when easy construction is desired it is difficult to avoid such a reduction of gas velocity. In the valves, the gas velocity is 60 meters/second (11,800 ft. p.m.), and at the outlet from the cylinders, with a section of 35 mm., the gas velocity is 21 meters/second (4770 ft. p.m.).

This engine is timed with an exhaust lead of 46 deg., and with a lag of 22 deg. to the intake opening. The crankshaft is carried on two bearings, the crankcase not being divided horizontally. A bolted-on rear plate is used in order to cheapen the cost of production. The main bearings are of bronze, lined with anti-friction metal and the connecting-rod bearings have white metal run in direct.

The crankshaft is a steel drop forging, with a tensile strength of 85—100,000 lb. per sq. in., machined only on the bearing surfaces (Fig. 18). The explosion pressure is about 22 kg. (310 lb. per sq. in.), but in the calculations it has been taken as $P_x = 27$ kg. (390 lb. per sq. in.).

The total pressure on the piston at the moment of explosion therefore becomes:

$$P_x = S \times P_x = 50.26 \times 27.5 = 1400 \text{ kilos.}$$

According to Fig. 18,

$$P_1 = \frac{P_x \times 500}{480} = \frac{1400 \times 500}{480} = 875 \text{ kilos.}$$

$$P_2 = \frac{P_x \times 180}{480} = \frac{1400 \times 180}{480} = 525 \text{ kilos.}$$

The diameter of the shaft being 55 mm., the section X—X is stressed to

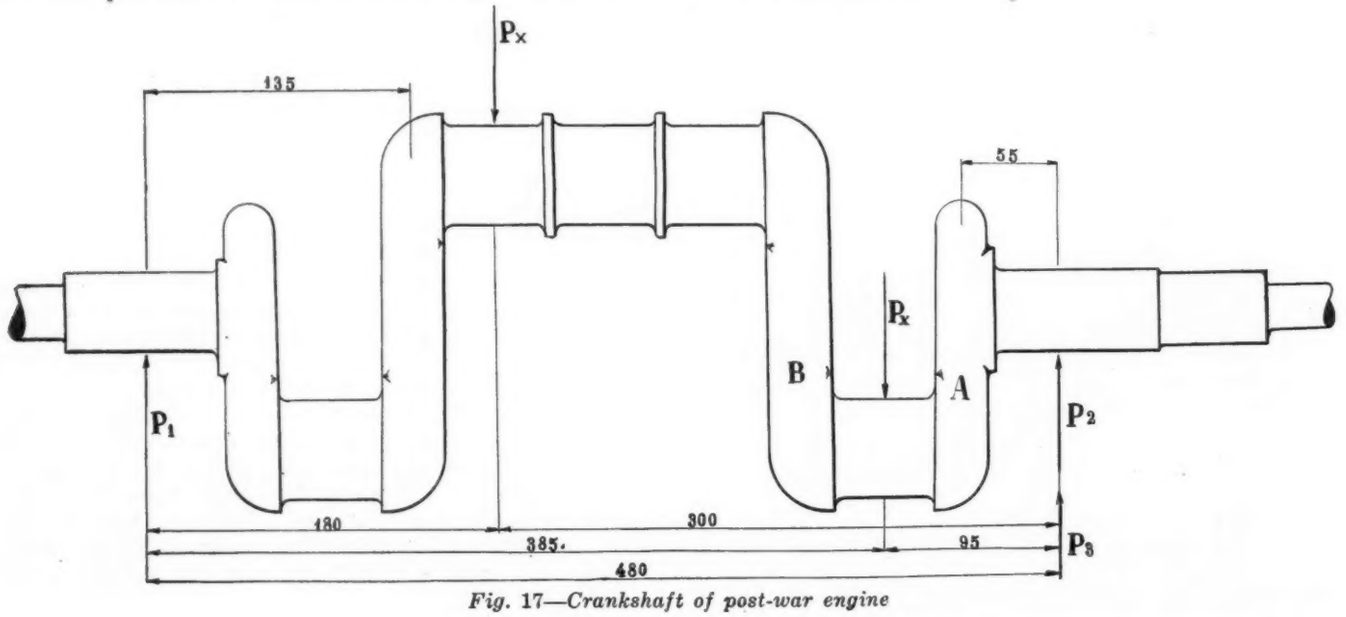


Fig. 17—Crankshaft of post-war engine

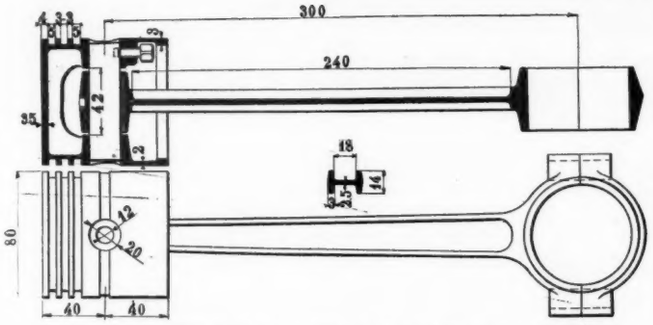


Fig. 18—Piston and connecting rod of post-war engine

$$S = \frac{M}{W} = \frac{P_1 \times 18}{W \times 55} = \frac{875 \times 18}{16.33} = \text{9.7 kilos. (13,800 lb. per sq. in.)}$$

The web A, which has an oval section, for ease in forging is stressed to

$$P_s = \frac{P_x \times 385}{480} = \frac{1400 \times 385}{480} = 1120 \text{ kilos.}$$

$$M = P_s \times R = 1120 \times 5.5 = 6300$$

$$S = \frac{M}{W} = \frac{6300}{0.785 = b \times a^2} = \frac{6300}{0.785 \times 6.5 \times 1.4^2} =$$

6.3 kilos. (9000 lb. per sq. in.)

The web is stressed to

$$S = \frac{M}{W} = \frac{875 \times 18}{0.785 \times 6.5 \times 1.7} = \text{7.9 kilos (11,200 lb. per sq. in.)}$$

The bearings are loaded as follows:

Connecting-rod bearings:

$$p = \frac{P_x}{f} = \frac{1400}{5.5 \times 5.2} = \frac{1400}{28.6} = \text{49 kg. per sq. cm. (697 lb. per sq. in.)}$$

Main bearings:

$$p = \frac{P_x}{F} = \frac{1120}{4.5 \times 8} = \text{31 kilos per sq. cm. (441 lb. per sq. in.)}$$

The piston pin, which is of case-hardened steel (Fig. 18) is loaded as follows:

$$S = \frac{M}{W} = \frac{P \times 2 \times l_2}{W_2 - W_{12}} = \frac{700 \times 2.6}{785 - 170} = \text{29 kg. per sq. cm. (412 lb. per sq. in.)}$$

The piston pin is hollow and is of better design than the one in the earlier engine, which is solid.

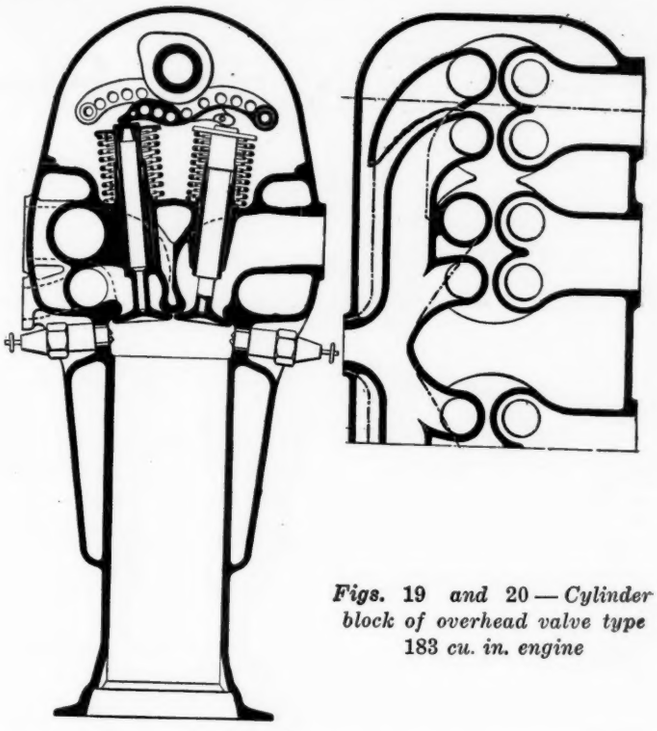
The connecting rod, Fig. 18, is a semi-mild steel drop forging, and is loaded to 10.6 kilos (15,000 lb. per sq. in.) under compression and resists flexion by compression with a factor of safety of 4.2. The camshaft is carried in two bearings only and is loaded under flexion to 9 kilos (12,800 lb. per sq. in.).

Oil Pump Capacity

The oil pump delivers 11 liters (2.9 gal.) per minute. The timing gears are cut with helical teeth and are steel against cast iron. The fan, which has a diameter of 360 mm., runs at 2800 r.p.m. Cooling is by thermo-syphon, with inlet and outlet pipes of 55 mm. diameter.

This type of engine is cheap to build. Its 30 mm. carbureter allows it to throttle down perfectly and gives it a rapid pick-up. Both the types described are of simple construction and are durable, while developing sufficient power for service on comparatively heavy chassis taking five-passenger bodies.

It is also possible to build intermediate types between the stock, cheap production 183 cu. in. engine and the special racing machine. There is, in Europe, a rather pronounced tendency in favor of these high-efficiency engines which, while not being pure racing models, are nevertheless fast types. Naturally they are costly engines to build. They must have a hemispheric combustion chamber and generally four valves in the head, operated by an overhead camshaft. An interesting engine of this type, shown in Figs 19 and 20, has two sets of inlet valves and a double carbureter. One carbureter feeds the engine through the big valves. This makes it possible to throttle down and get satisfactory slow running and at the same time to obtain a great amount of flexibility. With an engine on these semi-racing lines it is possible to obtain from 50 to 80 hp.



Figs. 19 and 20 — Cylinder block of overhead valve type 183 cu. in. engine

Chassis Features

Except that they invariably have four speeds, the chassis of the European 183 cu. in. engines do not present great departures from American practice. It is difficult to make a close comparison for, with hardly any exceptions, the American car with a small engine has been a cheap car, whereas in Europe many of the small cars are quite equal in quality to the largest machines.

Before the war, the weight of both the chassis and of the complete European 183 cu. in. car was generally heavier than on American machines of approximately the same piston displacement. Sustained high speeds over rough roads tended toward a heavy chassis construction.

Since the war there has been a considerable all-round reduction in the weights of chassis. This has been obtained first by improved design, including the adoption of unit construction of engine and gearbox, with aluminum castings for crankcase and gearbox, the abolition of the sub-frame, more modern rear axle.

A good average weight of complete chassis is 1900 lb., and of the complete car, with water, gas and oil, 3000 lb. There are a few lighter cars on the market but none with chassis weight including tires below 1700 lb.

The racing Sunbeam gear ratios, laid out for average roads, are of interest. With driving wheels of 880 x 120, the driving pinion and crown wheel were 23-72, giving a direct drive ratio of 3.13 to 1. The other ratios were as follows:

Third speed	3.9 to 1
Second speed	5.8 to 1
First speed	8.8 to 1

Heat Treating Steel by New Method Claims Valuable Results

The material is quenched at a definite point in the heating when the temperature rise shows a marked decrease and a change from the previous uniform rate. This article, with special reference to automotive work, explains the process and the improvements claimed for it.

A NEW method for the heat treatment of steel has recently been introduced. The hump method, as it is known and patented, utilizes the outward manifestation of changes in internal structure which takes place when steel is heated past the so-called critical or transformation point to indicate when the work should be withdrawn from the furnace. The temperature of the furnace and, therefore, of the work, is raised at a uniform rate until the transformation point of the steel is reached. At this time, there will be a marked decrease in the rate of temperature rise. The change in the rate of rise is made plainly visible to the operator by an autographic recorder connected to a thermocouple placed close to or in contact with the work. The effect is clearly shown by a bend or hump in the curve, as at C, Fig. 1.

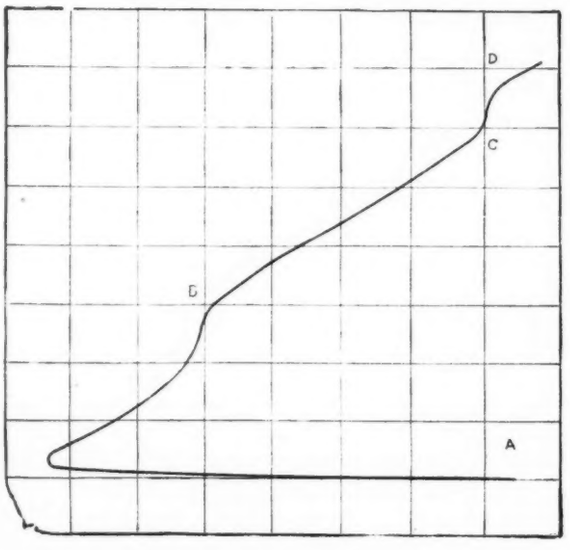


Fig. 1—Chart from a curve-drawing pyrometer showing hump C-D due to passing of steel through the transformation point

This hump corresponds to a pause in temperature rise or decrease in rate of heating of the steel, which occurs in spite of the fact that heat is being transferred to the work during this interval as rapidly as before or after. It is explained by metallurgists as being due to the dissolving of cementite, or carbide of iron, in the pure iron, or ferrite, and to other chemical and physical changes, depending upon the composition of the steel. By microscopical and chemical means, it is known that the physical and chemical structure of steel after quenching is profoundly influenced by the relative time of quenching with respect to the time at which the arrest occurs. The hardness, strength, ductility and toughness are each definitely influenced.

Inaccuracies with Pyrometers

As a guide in hardening, the temperature pause, or decalescence point, as it is called, is much more reliable than is the furnace temperature as indicated by a pyrometer. If the work be controlled with reference to temperature readings only, there are several possible sources of error, namely:

(a) The thermocouple may be at a temperature different from that of the work, due either to insufficient time having elapsed for the work to assume the furnace temperature or to inequalities in temperature between different parts of the furnace. Experiments which have been made with commutating recording pyrometers connected to read alternately upon two or more thermocouples in a single furnace show how surprising differences in temperature persist even after prolonged "soaking". To insure that the work shall actually reach the desired temperature within a reasonable time, the furnace is often held at a higher temperature, which is afterwards reduced. The "soaking" and possible overheating of the work may, and often do, result in injurious growth in grain size in metal being treated.

(b) In attempting to hold the furnace at a constant temperature, the temperature may fluctuate and, even though it may subsequently be reduced to the proper temperature, the work may nevertheless have been overheated and injured. In the hump method, the quench is made as soon as the work is at the right distance above the critical point and the work is given no opportunity to reach an excessive temperature.

(c) The temperature which is assumed as the critical temperature of the steel may not be correct. On the other hand, using the hump method, the time at which each lot of material passes through the critical point is definitely located.

The lead pot and the fused salt bath methods of heating work for hardening give greater assurance than does the ordinary furnace that the work shall reach a uniform temperature, but there still remain uncertainties as to the actual transformation temperature and as to accuracy of the temperature measurement, and growth in grain size, due to too long immersion, may occur. Lead or salt baths give no control whatever of the rate of heating. Hardening baths also have many practical disadvantages, such as expense, dirt, necessity of cleaning the work, space occupied, etc.

(d) The pyrometer used for measuring furnace temperature may be incorrect.

Accuracy of Instrument Not Essential

The user of the hump method need not concern himself about the absolute accuracy of his pyrometer, nor bother

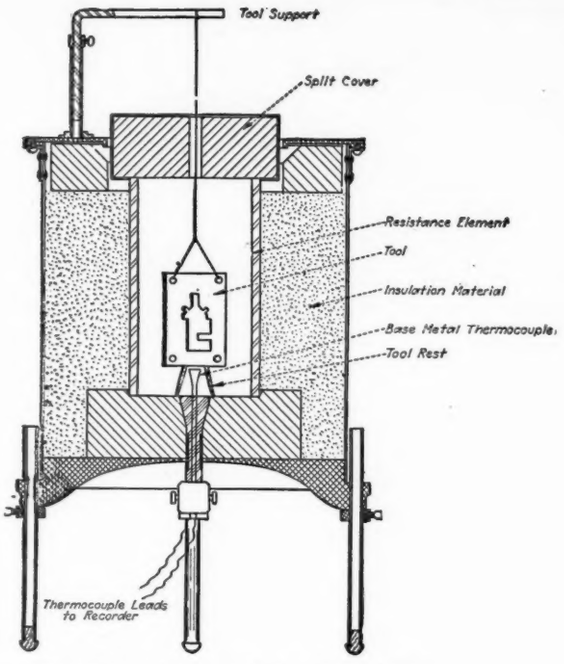


Fig. 2—Electric furnace used for heat treatment of tools, dies, etc., by the hump method

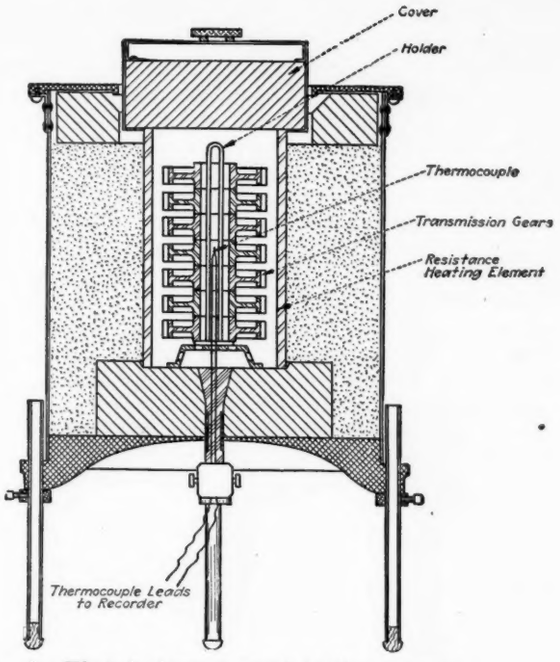


Fig. 3—Electric furnace used in the commercial production of automobile gears by the hump method

with independent transformation point determinations. It is not at all necessary that the temperature indicated by the thermocouple should be the correct temperature of the work, for so long as the recorder connected to the thermocouple shows clearly the pause in temperature rise, the moment at which transformation occurs is definitely known. Having learned by trial just how many minutes should elapse after the beginning or end of the transformation before the work is removed from the furnace, he is upon sure ground and can repeat results.

Method of Operation

Uniform, standardized conditions and a control of the rate of heating the work are essential to the hump method of heat treatment. A small furnace for heat-treating tools, dies, etc., is shown in Fig. 2. The heating element consists of a vertical, cylindrical resistor, surrounded by insulating material in a sheet-iron jacket. The resistor rests upon a refractory block, which is supported by a cast-iron bottom plate. The heating chamber is closed at the top by a refractory cover, while a cast-iron top-plate confines the loose insulating material, filling the space between resistor and jacket. An iron-constantin thermocouple of bare No. 8 gage wire projects upward from the center of the bottom refractory block.

By means of a small wire attached to a tool support on the top plate of the furnace, the work to be treated can be suspended in close proximity to, or touching, the end of the thermocouple. In production furnaces other methods of supporting the work are used. For example, in the furnace shown in Fig. 3, designed for heat-treatment of automobile transmission gears, the work is placed upon holders before insertion in the furnace. Covers placed on the furnace completely close in the heating chamber, preventing renewal of the atmosphere and the work is thus protected against oxidation and scaling.

At the moment when the work is introduced into the furnace, the temperature of the latter is, say, 1400 deg. F., but, the heat storage capacity of the furnace walls being small compared with that of the charge, the temperatures of both thermocouple and furnace walls drop rapidly a few hundred degrees, the current through the heating element or resistor being shut off during this time. The result can be seen in the chart made by a curve-drawing pyrometer connected to a thermocouple located in a furnace operated in the manner just described, as reproduced in Fig. 1. The temperature drops rapidly from 1400 deg. F. at A to about 870 deg. F., and then rises slowly to B, where it is stationary, the thermocouple, furnace walls, and all parts, small and large, of the charge having reached approximately the same temperature. The switch is then closed, the input being so regulated that the temperature rises at the desired rate. The fact that the work and furnace start from the same temperature at B, far below the critical point, coupled with a proper arrangement of the heating element, with respect to the charge, insures that all parts of the work will go through the critical point at the same time.

Tne arrival of the work at the transformation point C causes an abrupt change in the rate of heating, due to the suddenly increased capacity of the steel to store heat, the temperature stops rising or proceeds much more slowly than before, although the rate of supply of heat energy has not been changed. However, once the transformation is completed, as at D, the temperature again rises rapidly. The pause is plainly shown by the hump in the curve.

Before quenching, it is necessary to heat the work for a certain time after this point, the time depending on the mass and shape of the steel, the quenching medium employed and the qualities desired. The exact further heating to be allowed after the completion of the transformation point is learned by experience or trial but, once known, all uncertainty as to the result is practically eliminated.

Uniformity of Structure

It is claimed that each piece of work carried the same distance beyond the reference point C or D will show the same internal structure. This is true whether the temperature represented at the point C on the chart is correct and whether it is the actual temperature of the steel at that moment. The important fact is that the chart tells

the attendant when the steel is going through the transformation, from which he may know that quenching after a certain interval will secure the desired physical qualities. Furthermore, the chart remains as a record of just how each individual lot of steel was treated and can be referred to in connection with properties developed in physical tests of that steel.

It is found that the rate of temperature increase has a marked influence upon the properties exhibited by the steel after quenching. The resistance furnace is admirably adapted for controlling the rate of temperature rise, since the rate of energy input is easily regulated by reference to an ammeter supplied as part of the furnace equipment. The potentiometer pyrometer, Fig. 4, is likewise peculiarly suited for carrying out the hump method of heat treatment, and it is sensitive to small changes in thermocouple e.m.f. and exhibits changes in rate of temperature rise upon a magnified scale.

Used in Hardening Tools

As an example of the use of the electric furnace in hardening tools, the manner in which punches and dies are produced in a shop where this method has been used exclusively for the past six years will be described. One of these punches and dies is shown in Fig. 5. The punch is first made in the ordinary way by machining and hand finishing. It is easy to secure accuracy in the making of a punch, as all measuring, gaging, etc., is done on the outside. The die is made to approximately the correct size, but slightly smaller. The punch, having been hardened and ground to exact dimensions, is then used as a broach to cut the die. It is forced into the die a short distance, raising a burr, which is removed by filing, the operation being repeated until the cut is finished. The die is then relieved, but no further work is done on the cutting edge. After hardening the die by the hump method, the size and shape are found to be so exact with respect to the punch that subsequent work, as stoning or grinding, is not required.

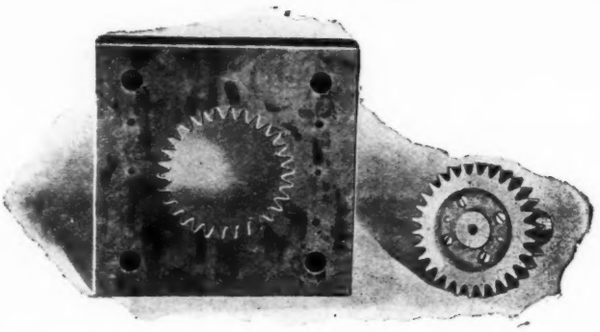


Fig. 5—Blanking punch and die hardened by the hump method. The die was broached by the punch and then hardened

In Quantity Production

Production operations are greatly simplified by the use of electric heat-treating furnaces with the hump method. As an example refer to Fig. 6. Formerly in this plant automobile transmission gears were heated for hardening in lead pots located in the basement beneath the machine shop. After the gears had been machined, they were removed on trucks to an elevator, lowered to the heat-treating room, an uncomfortable place because of heat and fumes, and wheeled to the lead pots. The gears were placed in the lead pots in batches and, when they had come up to temperature, were lifted out one at a time and dropped into the oil-quenching bath. The time of heating in the lead pots was thus not the same for all pieces, and the temperature also varied with the location in the pot, possibly resulting in non-uniform hardness and grain structure. The gears were also sometimes injured by dropping upon one another in the quenching tank. The drawing was done in gas furnaces, followed by an oil quench. Upon their return to the machine shop, the gears were wire-brushed to remove adhering lead.

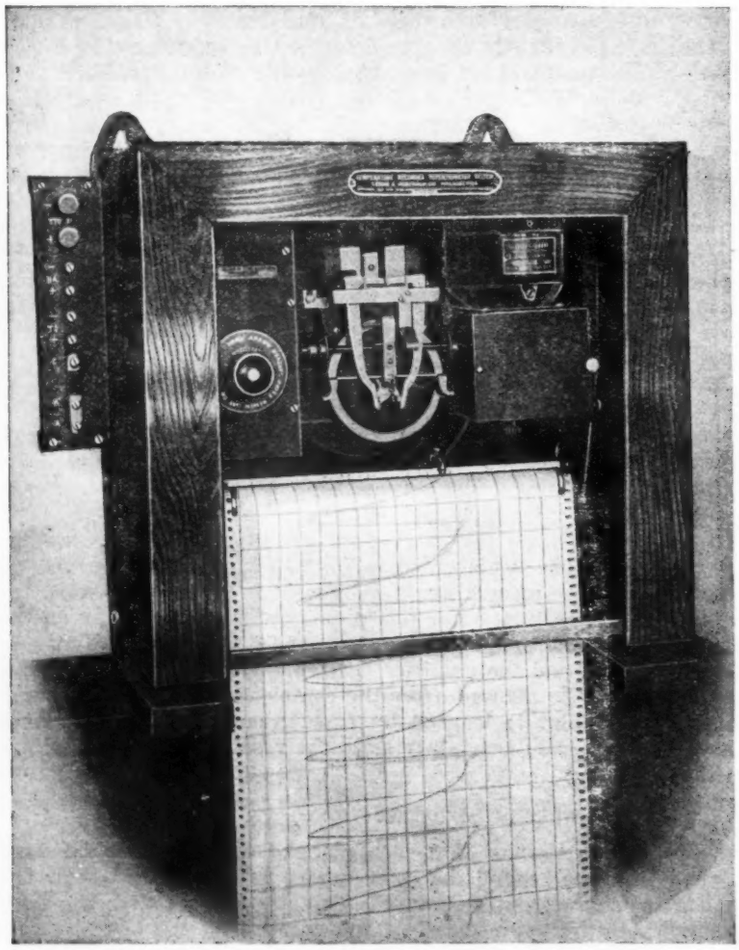


Fig. 4—Curve-drawing potentiometer pyrometer used in connection with the hump method of heat treatment

Electric Furnace in Machine Shop

The electric furnace equipment replacing the lead pots and gas furnace is located in the machine shop itself. There are six electric hardening furnaces located on two sides about a quenching tank, with three electric annealing furnaces on the remaining side, also a drain grid and the cleansing bath between the quenching tank and the annealing furnaces. The tops of all furnaces and tanks are flush with an elevated platform. The work is brought on trucks to the edge of the platform, where a boy arranges the gears upon holders, which are easily picked up by the operator, and upon which the gears remain until they have passed in turn through hardening furnace, quenching tank, cleansing bath and drawing furnace. Corresponding to each hardening furnace, there is a curve-drawing recorder, and for each drawing furnace an auto-

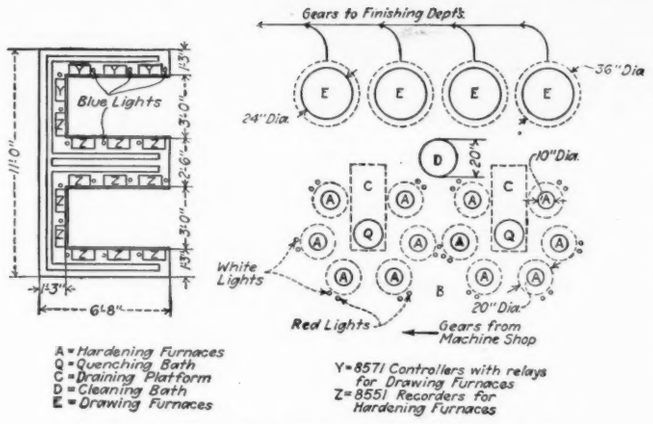


Fig 6—Layout of hump method heat treatment equipment in the machine shop of an automobile gear plant

matic temperature recording controller, all mounted upon a wall nearby, where also are the furnace rheostats. An assistant foreman on duty at this point directs the operations according to the indications of the curve-drawing recorders connected to the hardening furnaces.

The higher cost of electrical energy as compared with other sources of heat energy, is said to be more than repaid by the saving in necessary apparatus, such as pumps, blowers, burners, etc., and the labor costs, as the electric furnace can be located in the machine shop in the direct line of manufacture, thus saving the double handling of the work which is necessary where the latter must be taken from the machine shop to a hardening room and then back again.

Other advantages claimed for the use of the hump method in regular manufacturing are that it results in a higher grade, a more uniform output and simplifies handling and cleaning.

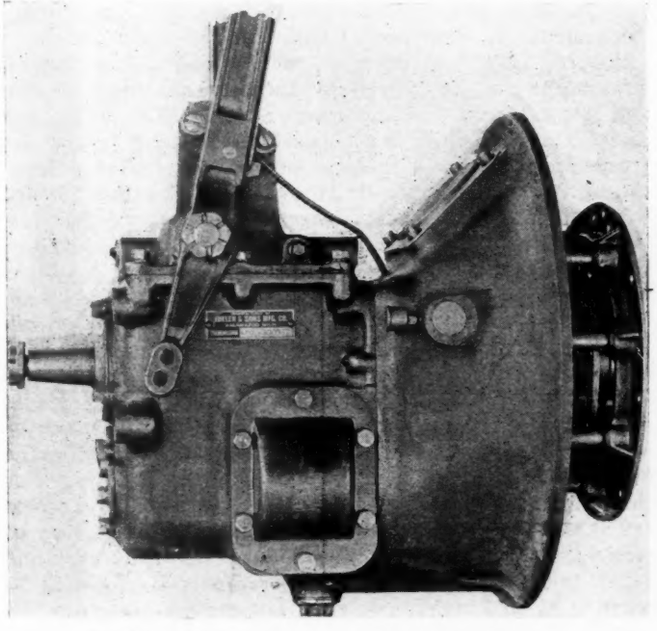
The hump method of heat treatment is controlled by the Leeds & Northrup Co., which company also manufactures the electric furnaces and curve-drawing pyrometers used in carrying out the process. Equipments for large-scale commercial production are used by the manufacturers of the Packard, Hudson, Dort and Nash motor cars, by the Detroit Gear & Machine and Brown-Lipe Gear companies and others in the automotive field.

Gearset for Pneumatic Tired Truck

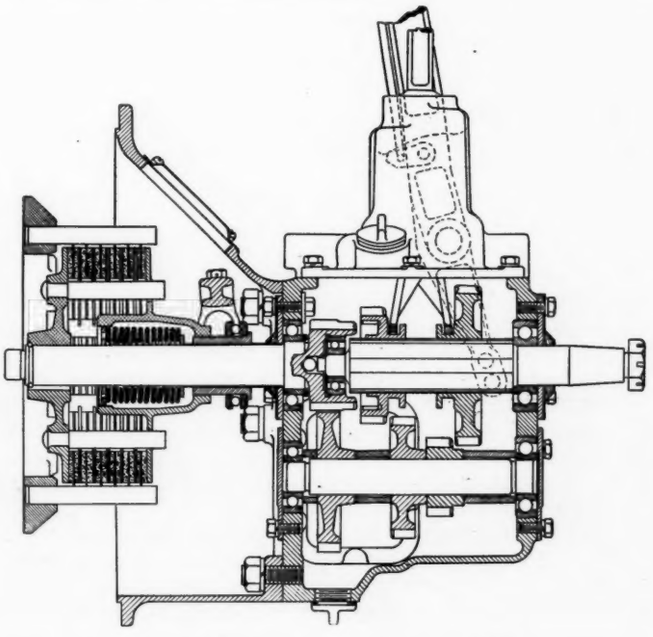
WITH the industry alive to the fact that rapid development is coming in the pneumatic tired trucks in the larger sizes, announcements of parts manufacturers of units suited for this purpose will be expected. A gearset has been brought out by the Fuller & Sons Mfg. Co., particularly designed for this class of work, as it has a low gear ratio of 4 to 1 and a standard S. A. E. opening on the right side for power take-off and on the left side for attaching a tire pump. This ratio is designed to meet the needs of pneumatic trucks, and also at the same time to fit different types of engines. The intermediate ratio is 1.7 to 1, and the reverse 3.5 to 1.

With the power take-off on the right side of the gearset, the engine can be utilized in the usual manner for operating dump bodies, hoists, winches and any other forms of mechanical devices requiring engine power. The structure and design of the gearset is illustrated in the accompanying sectional assembly. It is fitted with annular ball bearings throughout with a positive interlock on all speeds. The gears and shafts are made of 3½ per cent nickel steel, hardened and heat treated to give the necessary hard wearing surface and tough core.

This unit includes the clutch, which is a multiple disk type of saw steel with asbestos fabric facings. It is made in units suitable for 1½- and 2-ton trucks, unit powerplants, and a 2-ton type for amidships mounting. All of the dimensions are S. A. E. standard, the shift being the standard three-speed type. Mounting of clutch driving plate is S. A. E. standard for multiple disk clutches, as are all the other connecting and mounting dimensions.



Fuller gearset, made in two models



Section of gearset and unit powerplant

Automotive Products Made in Canada Expand in Quantity and Volume

An analysis of the manufacturing facilities of the Dominion is given herewith by a well-informed Canadian. In a measure, the article is supplemental to the analysis of the registration figures published in the recent Statistical Issue but this is devoted primarily to actual production there.

SOME conception of the growth of the automotive industry in the Dominion of Canada is glimpsed from the recently released statistics of the Automotive Industries of Canada (the National Automobile Chamber of Commerce of the Dominion). Nothing could be more impressive and striking in the growth of the Canadian industry than the statistics showing the annual registration of passenger cars and trucks in the nine provinces and the extent of value involved in production.

A few years ago the Canadian motor industry was considered almost negligible. To-day the automotive industry in this country employs more than 15,000 workers and represents an investment of more than $100,000,000. Last year the total value of sales amounted to over $100,000,000 and the payroll exceeded $15,000,000. During 1919 more than 94,000 Canadian motor vehicles were manufactured and it is safe to say this figure will be increased for 1920 by nearly 35 per cent, despite the untoward material and coal situation. The latest registration figures indicate that there are now close to 350,000 motor vehicles in operation in the Dominion.

Last year Canada imported from the States some 10,600 motor vehicles, of which nearly 9000 were passenger cars. Thus Canada was the best passenger car export market the United States has, buying roughly one American-made motor vehicle for every five of domestic manufacture. It is a matter of simple mathematics, then, that upward of 40,000 Canadian-made motor vehicles were exported. Canada, be it remembered, on the basis of population does five times the volume of foreign business of the United States.

The made-in-Canada automobile is a reality. Substantial factories for the production of engines, automotive equipment and tires have been built and manufacturers have invested upward of $100,000,000 in this Canadian industry, as aforementioned.

The automobile and equipment industry in Canada may be said to be practically confined to the Province of Ontario. In Toronto there are a number of automotive factories. Only one motor-car factory—the Willys Overland, Ltd.—is located there, but there are several tire plants and numerous companies manufacturing automobile parts, supplies, materials and equipment, such as cylinder and other castings and stampings, storage batteries, horns, lamps, floor boards, carpets, bumpers, chains, tools, enamels, paints, finishes, lenses, etc. At Oshawa there are three large plants of the General Motors Corp. of Canada, where the McLaughlin, Chevrolet and Oldsmobile cars are manufactured. During the past year extensive construction plans have been carried out at that town involving the expenditure of nearly $3,000,000. At Walkerville and Ford City the same building activity was evident in 1919 as at Oshawa. Nearly $5,000,000 was spent in constructing automobile plants, and block after block of workmen's homes were built. These houses are to be sold to the employees on a deferred-payment plan ranging in price from $5,000 to $10,000 each.

The Firestone Tire & Rubber Co. of Canada, Ltd., is constructing a $5,000,000 plant at Hamilton and the Dunlop Tire and Rubber Goods Company, Ltd., is erecting a $1,500,000 addition to its Toronto plant.

Other centers in which motor cars and trucks are manufactured are Kitchener, Chatham, London, Hamilton, Ottawa, Brockville and Montreal. As to parts, supplies and equipment, there are over a score of cities and towns in which they are produced. For instance, at Hamilton foot pumps, stampings, drop forgings, door hinges, door locks, bracket irons and various other motor details are manufactured; transmissions, differential gears, radiators and various forged parts at St. Catharines; fenders and bodies at Oshawa, Ford and Orillia; grease cups, spring shackle bolts, spark plugs, seat springs, etc., at Windsor; windshields, hub caps, running-board moldings and brackets, cushion retainers, robe and foot rails, scuff plates, floorboard moldings and various pressed-steel parts at Walkerville, Toronto and Oshawa; nuts and bolts at Ingersoll; tacks, nails and clinch buttons at Galt; tops at Toronto and Walkerville; tires at Toronto, Kitchener, Hamilton, Oakville, Montreal and Bowmanville; wheels at Windsor and Chatham, and innumerable other items in many towns throughout the Province of Ontario.

As this situation indicates, before long automobile requirements may be entirely produced within the Dominion and few parts may be imported. In view of that fact, the Canadian automobile export business will be greatly increased as it comes within the provisions of the preferential tariff decided upon by the Imperial authorities for export to the United Kingdom, this law going into effect Sept. 1, 1919. That means, in order to be entitled to one-third off the full customs rate, the total value of the manufactured motor vehicle in its finished condition must be not less than 25 per cent the result of labor within the British Empire, the proportion being calculated in accordance with the following detailed regulations:

"Where a number of separate articles are included in one parcel or shipment, each and every article shall be considered separately for the purpose of calculating the proportion of value due to labor within the Empire. For the purpose of these regulations, the total value of a motor car shall be its cost to the manufacturer at the factory or works, and shall include the value of the containers and other forms of interior packing ordinarily sold with it, when it is sold retail, but shall not include the manufacturer's or exporter's profit or the cost of exterior packing,

carriage to port and other charges incidental to the export of the goods subsequent to their manufacture."

In calculating the proportion of value which is the result of labor within the British Empire, there may be included under the head of labor the cost to the manufacturer of any materials of purely Empire origin entering into the composition of the car, the cost of manufacture, including wages, proportion of fuel, supervision and other factory expenses, and the cost of the labor of packing for retail sale. The following may not be included in the proportion of value which is the result of Empire labor. Any materials or interior packings not entirely of Empire origin; manufacturer's profit or the profit or remuneration of any trader, agent, or person dealing in the automobile in its finished condition; the expense of placing the goods in outside packages for export, and the cost of such packages, transportation, insurance and other charges for service after the motor vehicle leaves the place of production.

As a matter of fact, the Canadian automobile is much over 25 per cent the result of labor within Canada. The Canadian-made Ford, for instance, is 95 per cent Canadian by value. Accordingly, the year 1920 will see a vastly larger automobile export business to the various nations in the British Empire than heretofore.

From all indications, the demand for Canadian motor vehicles far exceeds the supply. This will be aggravated if the high rate of exchange between Canada and the United States prevails many months, as the spring season brings a host of purchasers. The Canadian factories are rushing production to the utmost limit, many have doubled their plants' production capacity, but motor-car manufacturers and parts makers are somewhat restricted in not being able to secure fuel, glass, steel and other materials. Taking everything into consideration, this year promises to be an exceptionally active period in the Canadian motor-car industry, which has assumed a pace of advancement and prosperity auguring well for all those connected with its ramifications.

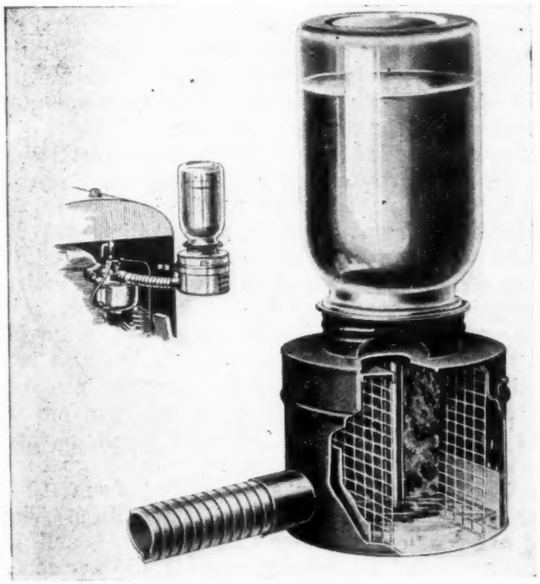
Three months ago there were approximately 1600 automobile dealers and distributers in the Dominion, 2264 garage and service stations and 500 automotive equipment and accessory jobbers and dealers. A surprise to many will be the statement that there are 53 tire manufacturers in Canada.

For those interested in the distribution of these automobile agencies, dealers, garages, service and supply stations, the following is given: Alberta, 432; British Columbia, 361; Manitoba, 107; New Brunswick, 107; Newfoundland, 6; Nova Scotia, 148; Prince Edward Island, 0; Ontario, 1460; Quebec, 474; Saskatchewan, 712.

Air Cleaned Through Wet Sponge

AGAINST air cleaners of the dry type the objection is raised that they do not remove the impalpable dust, because this dust is not heavy enough to be precipitated either by centrifugal force or by gravity. Wet-type air cleaners in which the air passes under and through water, will remove all the dust only when the bubbles formed by the air rising through the water are exceedingly small. This, of course, is allowed for in many wet cleaners by placing fine mesh screens in the water to break up the bubbles.

A new type of air cleaner in which water is used has been developed by the Midwest Engine Co. The method of cleaning the air in this device is to draw it through the pores of a wet sponge saturated through its capillarity by resting in about ¼ in. of water maintained automatically and supplied from the transparent reservoir above.



Midwest sponge type air cleaner

As the air zigzags through the pores, the dust is caught by the wet surfaces and held on the surface of and in the pores of the sponge. The sponge is washed out once or twice a day, depending upon the amount of dust in the air.

As the cleaner is used, dust will begin to work through the sponge, and if the day is very dusty the dirt may penetrate one quarter the way through. Every time the reservoir is filled, which will be once or twice a day, the sponge should be taken out and thoroughly washed in a bucket of water, put back and the reservoir put in place. There is a hole through the sponge for the feed pipe. When the reservoir is inverted, water will flow into the sponge cup until the end of the tube is covered, and as the water passes up by capillary attraction through the pores, more water will be fed to the sponge cup. Little water is said to be taken up by the air in this cleaner because the air cannot pick up globules of water, but only absorb sufficient for complete saturation.

Money and Men

THE labor turnover of a large shipbuilding plant near Philadelphia was 334.7 per cent during the year 1919. Each new employee at this plant is estimated to cost $50, and 23,520 were hired during the year. Thus the total cost of the labor turnover to that company was $1,176,000. The plant maintains a working force of about 7000 to 9000 men.

Labor turnover is entirely a personnel problem; the human element plays the major part in making it greater or less. When such costs as $1,000,000 a year for turnover are not uncommon in large plants, the necessity for a very careful and systematic study of this human element becomes apparent.

The Restriction of Trading with European Countries

Little real information as to such regulations has been extant in this country, states the New York office of the Bureau of Foreign and Domestic Commerce, and this article was written to explain some of them.

By G. F. Bauer*

IN numerous countries laws are constantly being enacted, modified, or repealed in an effort to secure some relief from the effects of oppressing economic conditions. Especially is this true in those countries of Europe which are confronted with intricate problems in the readjustment of their national affairs to peace conditions. In such European countries, laws providing for the control of trade, perhaps better known as "trade restrictions," are required for the purpose, principally, of stabilizing exchange.

The adverse rates of exchange are partly a result of the present condition in our own foreign trade when our exports of merchandise to European countries continue to exceed by far our imports of goods from these countries. In order to counteract to them this ruinous tendency of importing far in excess of exporting, the European nations have resorted to various systems of trade restrictions, which, although different in detail, are all based on certain identical economic principles. The legislation formulated on these basic principles may be readily divided into seven distinct groups.

In the first group are included such laws as provide for a complete control of all imports. For instance, no imports into Austria from countries not included in the former Austro-Hungarian monarchy are permitted except under license. Application for such a license must be made to the Ministry of Finance at Vienna. The granting of it is dependent on this official, who must be satisfied that the goods are actually required and not superfluous luxuries and also that the importer is a regular merchant who will sell the goods at reasonable prices and see that they are not acquired by speculators. Another country with a drastic law of this kind is Bulgaria. The *Devizna Tzentrale* of the Bulgarian National Bank is authorized to grant or withhold licenses according to the importance of the goods from the point of view of national economy. Thus, at the present time, Austria and Bulgaria are the two European countries which have a complete control of all imports.

In the consideration of the second group of laws, which provide for a partial control of certain imports only, it will be noted that to this principle the greater number of European nations adhere. Especially is this characteristic in those countries which have revised their customs tariff to meet changed conditions. For that reason, France and Czechoslovakia have a partial control of imports only. Italy is also revising its customs tariff and it is simultaneously reducing the number of restricted imports. In Portugal, the import restrictions are applicable to ninety-five commodities only. On Nov. 14, the Polish Government published a long list of articles that might be imported into Poland without special license, so that at the present time a permit is only required in cases where it is desired to import an article of a luxurious character. In Esthonia and Roumania, there is a tendency to permit the importation of all necessaries, including manufactured wares, and to prohibit entirely imports of luxuries. In Germany, however, raw materials and certain food products are the only articles included in the free lists for which no special license is required, while the imports of manufactured wares are generally restricted.

The United Kingdom originally proposed to restrict the importation of commodities that might be considered as products of its key industries, among which were included the manufacture of magnetos and optical instruments. The British courts, however, ruled as illegal such import restrictions and, since Dec. 20, 1919, no special license has been required to import into England any commodity whatsoever, including the products of the unstable industries. In Belgium, import licenses have been dispensed with, except in the cases of certain German products that might offer severe competition to such Belgian industries as have not fully recovered from the effects of the war. In Switzerland, the importation of coal is subject to control by the *Societe Cooperative Suisse des Charbon*, which has its headquarters at Basle.

The next or third group includes not exactly legislation but rather agreements having for their purpose a voluntary control of imports. There was considerable agitation in all the Scandinavian countries to control imports in this manner. As a result, Denmark and Sweden are now actually trying to offset the effects of an unfavorable balance of trade with no means other than voluntary cooperation of its bankers and merchants.

There are provided in the fourth group restrictions not only on the imports themselves but also on the exchange required in the payment for such imports. In Austria the term of payment must be approved by the *Devisen Zentrale*. Six months' credit, or payment in installments of three, six, nine or twelve months, is usually insisted on. An exception is made for foodstuffs urgently required, for the payment of which foreign exchange may be obtained from the *Devisen Zentrale*. It has also been decided that the value of all goods imported into Bulgaria must be deposited within a period of from one to two months with the Bulgarian National Bank in the name of the exporter or the consignor of such goods. This money is sequestrated for a period of from 10 to 12 months, counting from the date of importation. The bank pays 4 per cent on the sums thus deposited, and, in case they are converted into treasury bonds, 5½ per cent. The money thus held to the credit of the depositor may be

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released from sequestration before the expiration of the time limit in cases where it is desired to purchase therewith Bulgarian products. A ruling by the Ministry of Finance in Greece requires all importers to make a deposit of 20 per cent with local banks when placing any order outside of that country. Sworn statements must be made that the goods will be used exclusively in Greece. The deposit will not be refunded until the Greek customs certificate is shown and the transaction then checked by the Ministry. A lapse of 6 months without delivery will cause a forfeiture of the guaranty, which goes to the government. Failure to make the 20 per cent deposit prevents the banks from remitting abroad. This virtually abolishes open credit and consignment dealings and requires special caution on part of both buyer and seller. In Czechoslovakia, the *Devisen Zentrale* fixes the rates of exchange and also controls credits in foreign countries. It also is stated that the Portuguese banks are not permitted to sell foreign exchange unless authorized to that effect by a special commission. In view of the continued demoralization of the exchange, the Italian Ministry of the Treasury recently issued an order suspending stock-exchange dealings in foreign exchange. By means of an embargo on gold, the United Kingdom, France and Germany still exercise a direct control over a medium of exchange that is most suitable for the payment of imports.

The foregoing groups cover laws of a restrictive nature which have been enacted in European countries for the control of imports. Similar laws, but for the control of exports, also are being enforced. Consequently, there might be placed in the fifth group such laws as provide for a complete control of all exports. Only two European countries have taken this drastic step and they have, at a comparatively recent date only, gained their independence, namely, Czechoslovakia and Esthonia.

Although the German Government controls provisionally all exports, there is a marked tendency on the part of the German Government to establish a free list of articles that may be exported without license. It is therefore probably best to include the German legislation in the sixth group. In that group would be classed, therefore, such laws as provide for a partial control of the exports of certain commodities only. To this modified form of export legislation such conservative nations as France, Italy and Belgium have resorted.

The Austrian Government is now preparing a list of articles that may not be exported except under license. It is indeed possible that no license will be required in order to export manufactured articles of luxury, even if made of materials of which the supply is short, such as textiles, leather and metals. The exportation of all Polish products is permitted with the exception of those which are needed in Poland and of which there is no surplus above the local needs. Although all restrictive measures have been repealed in the United Kingdom, there is still effective a control of certain exports. In Spain the export control is limited to foodstuffs principally, and in Sweden and Norway to grain and dried calfskins.

As there is apparently in none of the European countries an agreement providing for a voluntary control of all exports, there remains but one group of restrictions—the seventh. These laws provide for a control of exchange required in export transactions. It will be found that one of the countries with a drastic control of exports, Esthonia, also has a law requiring that all foreign currency received in payment for exports must be collected by the Esthonian Bank. This money is held under the control of the government for the use of importers. If, at the expiration of one month the money thus held has not been employed, the merchant is obliged to dispose of it to the Esthonian Bank at the exchange value prevailing on that date. The exportation of Austrian products, whether subject to license or not, is dependent on the approval by the *Devisen Zentrale* of the terms of payment. It is usually required that payment be made in foreign currency, which must be turned over to the *Devisen Zentrale.* Manufacturers of exported goods who require raw materials from abroad are permitted to retain a part of this foreign currency to purchase therewith such raw materials as they require. In Germany, the importation of currency received in payment for export must be effected through the banks. Transfers for one concern amounting to 1,000 marks per day, or 3,000 marks per month need not pass through these institutions. The Italian Government was for a while also trying to overcome its post-war difficulties by requiring that drafts payable in dollars accompany shipping documents as a condition for the release of exports to the United States.

From the foregoing, it is evident that the outstanding features of the European trade restrictions may be easily divided among the seven groups. Summarizing them, they provide either for a complete control of all imports, a partial control of imports, a voluntary control of imports, a control of exchange required in the payment for imports, a complete control of all exports, a partial control of exports, or a control of the exchange required in export transactions. An examination of any of the European systems of trade restrictions in force at the present time would reveal that it is in general constructed on the basis of these fundamental issues.

Specifications for Starting and Lighting Batteries

A CONFERENCE was held at the Bureau of Standards recently to consider a draft of specifications for starting and lighting batteries for military trucks, which had been prepared by the Bureau at the request of the Motor Transport Corps. These specifications, while intended for the Motor Transport Corps particularly, will probably receive wider acceptance in view of the fact that there appear to be no adequate specifications for starting and lighting batteries at the present time.

The conference was called, at the request of the Motor Transport Corps, by the Society of Automotive Engineers, who invited members of the Electrical Equipment Committee of that society, representatives of the manufacturers, members of the American Institute of Electrical Engineers' Committee on Storage Batteries, representatives of the Navy Department, the Bureau of Standards, and the Motor Transport Corps.

The matters discussed included the capacity and arrangement of the batteries; the method of rating them; specification for the construction, quality of materials, and the electrolyte. Tests of the battery were outlined to include measurements of the capacity, the retention of charge, the purity of the electrolyte, life tests and vibration tests.

While the general form of the specifications was agreed upon, together with a satisfactory system of ratings, some details as to dimensions and performance were left for further consideration of sub-committees, and, consequently, it will be some time before the specifications will be ready for publication.

Super-Charger Makes Flight Possible at High Altitudes

The problems of such flight were discussed by Commander Richardson at a recent S. A. E. meeting at Philadelphia. The Navy engineer believes that power loss due to decreased air density may be overcome and that many new instruments would be necessary for such flying.

POSSIBILITIES of flying at high altitudes were discussed by Commander H. C. Richardson, chief engineer of the Philadelphia Naval Aircraft factory, at the monthly meeting of the Society of Automotive Engineers, Pennsylvania Section, at Philadelphia on March 25.

Commander Richardson pointed out that an ordinary engine loses in power as the plane ascends on account of the decreased density of the atmosphere. This loss, however, can be practically eliminated by the use of a supercharger.

As the air density decreases the velocity required for sustentation increases as the square root of the ratio of air densities. The effective horsepower required increases in the same ratio. In other words, if the angle of attack is unchanged, the effective horsepower required increases in direct proportion to the increase in speed. For instance, at an altitude where the density of the air is only half as great as at sea level, the velocity required for sustentation is increased 41.4 per cent and the effective horsepower required to maintain this speed also is 41.4 per cent greater.

Commander Richardson cited the example of a plane fitted with a 400 b.hp. engine and with a propeller of 75 per cent efficiency. If a supercharger were used, so that the effective horsepower of the engine remained constant for all altitudes, the plane would be capable of a speed of 154 m.p.h. at sea level, 171 m.p.h. at 10,000 ft., 190 m.p.h. at 20,000 ft., 208 m.p.h. at 30,000 ft., and 233 m.p.h. at 40,000 ft. Unfortunately, no simple propeller could be designed to absorb this horsepower under the different conditions of air density, at the normal engine speed. One solution of the problem presented by this condition is the use of a variable pitch propeller and another the use of shift gears. A subterfuge method would be to fit the planes with a propeller much larger than necessary for use at low altitudes but this is objectionable because it cuts down the possible rate of climb.

Results had been calculated for a variable pitch propeller on which experiments had been made in the wind tunnel at Leland Stanford University. A chart was projected on the screen, showing how, with this variable pitch propeller, the maximum propeller efficiency can be maintained substantially constant for a wide range in speed, by changing the setting of the propeller blades from 4 deg. retard, in steps of 4 deg., to 24 deg. advance. A table was given of the engine speed in r.p.m.'s, the propeller efficiency in percentage, the engine horsepower and the effective horsepower at the propeller for five different settings of the propeller, for altitudes of 6560 ft., 14,100 ft., 23,450 ft., 29,500 ft. and 36,900 ft., and for speeds of 62, 93, 124 and 186 m.p.h. at each of the different altitudes.

Commander Richardson predicted that, by the adoption of superchargers and variable pitch propellers, it would be possible to attain altitudes of 50,000 ft. and travel at a speed of 260 m.p.h. Observations taken during recent altitude flights have established the fact that there is at all times a west wind of about 100 m.p.h. at such altitudes, so that an airplane developing a relative speed of 260 m.p.h. would really be travelling at 360 m.p.h. and could cover the distance from New York to London or Paris in 10 hours.

In such thin atmosphere as is found at over 30,000 ft. altitude, the effects of disturbance upon the airplane are greatly augmented and the best types of instruments, adjusted to work at low temperatures and pressures, must be used. The ordinary magnetic compass goes wild when the plane is turning and loses accuracy if the plane is inclined. The inclinometer also fails to indicate true levels when turning, and as at such altitudes the ground is indistinct and often obscured by clouds, surface indications can no longer be depended upon to determine the true altitude of the plane. The following set of instruments is believed to be necessary for flying at high altitude: A turning indicator with positive action; a highly sensitive compass; a centrifugal inclinometer, a drift meter, a radio compass, the usual instruments showing performance of the power plant; special oxygen equipment and clothing for the pilot and passengers, and increased cooling capacity for the radiating system.

The useful loads that can be carried will be reduced by the extra equipment needed, additional radiating capacity, supercharger gear and the increased weight of a variable pitch propeller or change gears if used.

Considerably higher speeds can be made at the higher altitudes. Thus at sea level the best cruising speed would be about 75 m.p.h.; at 30,000 ft. altitude it would increase to 130 m.p.h. The effective horsepower required would, however, increase from 62 to 106, the effect being that the cruising radius is substantially unchanged. The conclusion is arrived at that while by travelling at high altitudes we may greatly increase the speed of travel, the radius of action will remain substantially the same. In fact, unless the wind at great altitudes favors the direction we desire to take, we shall probably lose, because, while climbing, we must lift a load of gas and oil, thus expending energy to lift a weight that will be consumed in flight and which will not be available to return the equivalent energy in descent.

It appears that the variable propeller is principally useful as a governor at high speed. If it were not for limits to the number of revolutions per minute the basic form of propeller, carefully selected, would give greater effective horsepower than the modifications available in the variable pitch propeller. It also appears more than probable that shift gears would permit a most efficient combination for a specific occasion. Whether or not they should be adopted

will depend upon the possibility of developing and applying such gears without such an increase of weight as would make the net result a handicap instead of an asset.

In the discussion, Commander Richardson made some references to Major Schroeder's recent altitude flight. When starting on the climb, Major Schroeder headed directly west from Dayton; he kept his machine turned in a westerly direction at all times, and at one time got as far west as Indianapolis. However, at the higher altitudes there was a strong west wind, the velocity of which was considerably greater than the speed of the plane, and, when the maximum altitude was reached, Major Schroeder was a considerable distance east of his starting point. At 30,000 ft. the speed of the wind was approximately 100 m.p.h., while the speed of the plane was only 85 m.p.h.

Major Schroeder was overcome by the effect of the cold, became unconscious and fell a distance of about 5 miles, his plane attaining a speed of about 300 m.p.h. during the drop. He regained consciousness just in time to straighten out to prevent a smash, his altitude when the plane straightened out being only about 300 ft. above the ground.

Commander Richardson was asked what he thought of the possibilities of the helicopter. By way of explanation, it may be stated that a helicopter is a flying machine deriving its lift from two or more propellers on a substantially vertical axis. He said that he had no doubt such a machine could be built and could be made practical if the problem of stability could be solved. What worried him was the question as to what would happen to a helicopter if the power failed. It might be possible to make a helicopter safe under such conditions by making the surfaces reversible so that they would exert a drag on the descending machine. One thing that had to be taken into consideration was that in order to lift one pound with a helicopter a direct thrust of 1 lb. has to be exerted while, with our present type of airplanes, the forward thrust necessary to create a lift of 1 lb. is only from 1/10 to 1/6 lb. Also, the pull of the helicopter screws acts always at the center of gravity of the machine, but not necessarily in a vertical direction.

The Life of an Airplane

THE life of an airplane depends on two distinct assemblies: the power group and the structure of the machine. These have little in common, as far as their life is concerned, and their use requires different methods and usually a different class of mechanic for the upkeep.

Prior to the war the object of the designer was to get a machine that would fly, and little attention was paid to the durability of its parts. During the war it was discovered that the life of a machine in service was about three months, as it either was rendered obsolete or was crashed by the end of that period. This fact led most designers to sacrifice any considerations of durability in order to gain the prime military features of extreme speed and maneuverability.

Many of the larger aeronautical engine manufacturers of the world have remodeled most of their successful types with intention of increasing reliability. This has usually resulted in a slight increase in weight. Also the question of cost of overhauling has been gone into carefully and present-day engines are so designed that their accessories, valve gears, and similar parts are readily gotten at for cleaning and adjustment. The result is that most engines on the market to-day for commercial use can be relied on, with proper use and care, for from 125 to 150 hours without being overhauled. And if hoists, suitable benches, and other shop equipment are not available, valves may be ground and even pistons changed in many modern types without removal from the plane.

As mentioned above, war machines were designed for speed and not for durability. One feature, however, was developed as a result of the war which will have a great effect on the future use and development of aviation. That is the application of metal to the structure of the airplane. The Germans were driven to this by the lack of a reliable supply of suitable lumber. Some French and English firms also worked on this problem, notably Boulton and Paul in England and Louis Clement in France. Many inventors have brought forward alloys, new structural combinations, etc., with the object of using metal in whole or in part.

This development has been foreseen for many years, but presents a difficult problem. The effort to obtain the maximum of strength with the minimum of weight resulted in vastly refined types of internal structure and thorough investigations into the strength and properties of the available materials. All of this data and knowledge is now available to the designer who is working with the idea of durability.

The great shortage of good linen prompted an investigation of other materials as a substitute. Various weaves of cotton and cotton with linen were developed which have some properties of value that all-linen has not, besides being cheaper. Streamline wire was brought out of the experimental stage and can be obtained of equal strength and reliability with stranded cable.

In Explanation of the Financial Statement

AN educational step of practical value was taken recently by the Eisemann Magneto Corp. when it attempted to explain in language intelligible to the layman, its semi-yearly finance report. The statement was presented in a recent issue of the company's house organ over the signature of W. M. Shaw, president of the company. An attempt was made to explain to the employee just what the various items of the statement mean, together with the significance of the more important ones. While some improvement might be made, the concern has undoubtedly caught a vision of practical employee education.

President McCauley, of the Packard Motor Car Co., attempted something of a similar nature recently, when he addressed the members of the Packard Ten Year Club. He explained the disposition that was made of profit, and showed the necessity for paying a fair return on the capital invested in the corporation.

To the average man, whether a manual worker or not, a financial statement is usually an enigma. Since man inherently fears that which he cannot understand, this interpretation of financial statements by employees has caused much unwarranted discontent and distrust. Consequently, education along these lines has a very definite and practical value. Such education, which will go far toward convincing the employee that all the cards are face up on the table, is likely to convince him that confidence in his employers is not being misplaced.

Trans-African Flight Attempts Reveal Aviation Handicaps

Five planes essayed the 5,200 mile trip from Cairo to Capetown, none finishing the course. Engine troubles, principally due to the cooling systems, and the effect of the tropic heat, caused the flights to fail.

RECENT reports in this country of the outcome of the British attempts to fly across Africa, from Cairo to Capetown, a distance of some 5,200 miles, are interesting as showing the dependability of present-day aerial engines and of plane structures. They also are interesting from their revelations of the effects of altitude and tropic heat upon such cross-country work, these being factors for solution in planning and carrying out lengthy commercial routes such as, for instance, one that might be projected to carry mails between the United States and South American ports.

The African flight ended, unfortunately, in failure, although the Vickers-Vimy *Silver Queen II*, whose engine had flown from England to Cairo before attempting the trip to Capetown, was almost in sight of its goal when it crashed at Bulawayo, on March 7, about 4,100 miles from its northern starting point. Another ship of the same make, flown under direction of the London *Times*, negotiated more than half the cross-African limit, in a difficult trip, made more difficult by leaking water jackets. This plane and engine also had flown from England.

The details last received from London record partially the reasons for the lack of success of the five planes that attempted the trip. Three of them crashed within 600 to 800 miles of Cairo, only the *Silver Queen II* and the *Times* machine proceeding far into the continent. Their experiences are the most illuminating and should be studied by engineers interested in aviation and automotive practice.

The *Times* machine, which carried an independent reporter and newspaper man, has furnished more information of its trip than the leader. The *Times* machine was piloted by Captains Cockerell and Broome. It flew from England to Cairo with but little difficulty and left the latter place with the crew confident of reaching Capetown without difficulty over the route laid out by British fliers and engineers. But shortly afterward, and while flying over the hot desert, the engines, which were of Rolls-Royce design, became overheated, and, before a landing place could be found in the rough country, the cooling water was almost exhausted. The result was the natural one of impairing the cooling system to such an extent that final success became impossible.

Emergency Repairs

The crew, however, was able to rig up an emergency pump and take other measures to overcome the difficulty. The diary of Dr. P. Chalmers Mitchell, the *Times* observer, for the remainder of the trip is filled with references to the leaking jackets and to the attempts to rectify it. But the crew could not carry out the necessary repairs. At Kisumu, on Lake Victoria, about half-way to Capetown, the fliers believed they could get new engines and they pushed on to that point. But the engines were not available, reports saying cryptically that "they had been immersed in salt water," probably in shipment, and so it was necessary to continue from there with the old leaky units.

Many difficulties already had been surmounted. Several forced landings in the rough country were necessitated, in which the fliers were exposed to fevers, wild animals, and even hostile natives, and long waits before restarting subjected the men to many privations and hardships. The heated air and the altitudes caused trouble at numerous times in getting off the fields and accidents from that cause were narrowly averted, it was reported.

From Kisumu they made only the short distance to Tabora, about 2700 miles from Cairo, where the big plane crashed in attempting to get off the field to make the next leg. Doctor Mitchell reported the accident as "due to leakage in the induction coils," and the smash made it impossible to continue further.

Engine Cooling in the Tropics

Writing in the London *Times* recently, C. Johnson, managing director of the Rolls-Royce company, stated that the plane should not have continued after its trouble below Cairo. His comments on the cooling system were:

"The point for solution is why the engines heated. It may be that, when all the necessary information has been received, a simple answer to this question may be found. It may be that means taken to cool engines in northern climes, or which may be suitable for flying at high altitudes in hot countries, are insufficient for flying with heavy loads at low altitudes under the climatic conditions of the Cairo-Cape route. Cooling an engine when flying low over hot desert sand is a different problem from cooling an engine at 10,000 ft."

Mr. Johnson added that, since the armistice, Rolls-Royce engines have flown more than 134,000 miles without cylinder leakage trouble. He expressed confidence that such difficulties would not occur often.

"The planes, propellers and controls gave no trouble," Doctor Mitchell wrote. "The passengers' seating, the position of the windows and the accommodations of spare parts and food supplies require consideration. The morning cold makes a rug for the feet requisite; otherwise extra clothing is unnecessary. The existing arrangements for ventilation are sufficient, even during the great heat."

In considering the flight, the varying conditions met with must be considered. Part of the trip was over desert, much of it was above jungles, swamp and brush, and a great part was at high altitudes. Great heat was encountered and at one time Mitchell declared that certain conditions made large wing surfaces necessary. Much of the flying was close to the ground, power being insufficient to lift the machine through the heated air, and this added to the dangers of enforced landings.

Many details concerning the trip of the *Silver Queen II*,

which was piloted by Lieutenant-Colonel van Ryneveld, a South African, have not been received, the most definite having been a message to the Rolls-Royce company saying the crash was due "to taking off with overload at high altitude" of the Bulawayo airdrome. Ryneveld, in his flight from England to Cairo, suffered from storms and gales and his machine was severely battered in the long trip across the Mediterranean, in which his time was only two hours less than that of Alcock and Brown across the Atlantic.

To Cairo van Ryneveld flew in the *Silver Queen I.* It was crashed, however, at Korosko, just below Assuan, near Cairo. The engines were salvaged, returned to Cairo, and, after an overhaul, were placed in the *Silver Queen II,* in which the flight was made to Bulawayo. Throughout this trip, the pilot reported little engine trouble and, at Bulawayo, stated that he hoped to obtain another plane into which the same powerplant might be installed for continuing the trip.

The *Silver Queen II* seems to have had its greatest difficulties because of the altitudes and the heavy heat. Below Mongalla, at an altitude of 7,000 to 8,000 ft., the plane met innumerable whirlwinds caused by the terrific ground heat. "The machine was thrown about in a most uncomfortable manner," it was reported. "At Abercorn," the report continues, "the highest landing place on the route, the fliers had to discard everything not absolutely essential in order to leave the ground at all. Heat and altitude made both landing and taking-off matters of difficulty and anxiety."

Of the other planes that made the attempt, a Handley-Page was crashed at Shereik, on Feb. 26, the smash having been caused "by an accident to the plane structure." The other machine, the *Silver Queen I* being considered the fifth, was a Vickers-Vimy R. A. F. plane that had a forced landing at Korosko.

English newspapers and technical papers have been reviewing the flight attempts since the unfortunate crash of the van Ryneveld machine. The comments, which showed in a measure the hopes of the British that a successful aerial line might be established across the African continent, were almost a unit in saying that commercialization of the route would necessitate relay flights, the mails and passengers to be transferred from plane to plane at the intermediary points. The route, because of the British influence and dominions in Africa, is an important one to that country and direct communication between the north and the south, of course, is slow and backward.

The Junker Metal Airplanes

SOME information concerning the metal airplanes designed by the Junker firm in Germany has been issued by the Technical Department of the British Air Ministry through *The Aeroplane and Flight.* These machines are of great interest to all connected with aviation, not only because of their metal construction, but also because of their other design features.

Two models are described: an armored two-seater biplane, type J-1, and a single-seater pursuit monoplane, type D-1. Both are constructed entirely of metal and have cantilever wings. This firm has also produced a commercial six-seater cabin monoplane, which has been illustrated in the daily papers. Its construction is undoubtedly similar.

The wings have a deep section with a thick, round leading edge. This is also probably a "high lift" section and is in accord with general German and Fokker practice. They do not have spars, as the term is generally understood, but have a rather large number of tubes running along the wing. In both types these tubes support the top and bottom surfaces. The biplane has ten such tubes in the upper wing and six in the lower. With the exception of two in each wing, they are arranged in pairs, that is to say one under the top surface of the wing over one on the lower surface. They are braced to each other within the wing by smaller tubes in such a way as to form a Warren truss between any two spar tubes. In the monoplane there are seven spar tubes, not in pairs, but evenly spaced when viewed from above; the bracing is the same. This construction appears to have sufficient strength to carry the bending moments due to the cantilever design.

The fuselage of the biplane is made in two parts: an armor box containing the crew and engine, and a tail section built up of duralumin tubes in the form of a box girder and cloth covered. The pilot is under the center section and a square hole is cut in the upper wing for him to see through. The landing gear and center sections with their struts form a unit. The struts at the center section are the only ones on the machine. There is one pair on each side sloping outward and running from the lower wing roots to the upper center section. They are braced by another pair on each side, which cross to make an X and have the same fitting at the upper plane as the first pair. At their base they join the fuselage.

The metal used both for bracing and covering is duralumin. The covering of the wings is corrugated with the grooves running parallel to the line of flight. The sheet used for wing covering on the biplane is 0.015 in. thick and weighs 3.65 oz. per sq. ft. On the monoplane it is 0.014 in. thick. The bracing is of the same material, but steel is used generally for fittings.

The brief specifications of these two machines are:

D-1: Type, single-seater, pursuit monoplane; engine, 160-hp. Mercedes; span, 29 ft. 2 in.; length, overall, 22 ft.; total wing area, 158.8 sq. ft.; speed, 140 m.p.h.

J-1: Type, two-seater, armored biplane; engine, 230-hp. Benz; span, top 55 ft., bottom 35 ft. 7 in.; length, overall, 29 ft. 8 in.; height, overall, 11 ft. 9 in.; weight, empty, 3724 lb.; useful load, 845 lb.; wing loading, 8.5 lb. per sq. ft.; power loading, 19.9 lb. per hp.

Conditions of the Dutch Automobile Industry

THE automobile parts industry in Holland showed increased activity during the last half of 1919, according to an official report. Automobile and body factories also are gradually obtaining more work. There is a steady demand, especially for bodies, but the high prices result in much business going to the United States. As regards the supply of raw materials, the situation has improved materially, yet export business is still rather quiescent, especially as regards bodies for new chassis, which latter must be obtained outside the country. There is general complaint regarding the low productivity of the workmen and the lack of skilled labor. It is expected that in the near future the demand will exceed the supply, as, in view the reduced working hours and the scarcity of skilled labor, production has materially decreased. The manufacture of motorcycles is increasing considerably. A difficulty met with in this line is that the Dutch foundries cannot do the foundry work on complicated motor parts as perfectly as foundries in other countries.

European Labor Indicates a Slow Return to Normal Production

Leaving Belgium out of the consideration, Mr. Tipper sees few prospects for an immediate active competition by Continental factories with those of America. One reason for such a declaration is the political activities of the labor groups in the old countries. This brief study, however, takes up other phases of the complicated European situation.

By Harry Tipper

THERE is nothing in the European labor situation which would presage the return of European countries for some time to active competition with the United States in prices and ability to deliver. The power of the workers' organizations in these countries is much greater than it is in the United States, and the industrial troubles are so intimately connected with the political situation that they cannot be reviewed separately. In addition to the fact that the aspirations of the working class have been augmented by the better economic conditions operating during the war, there is a class solidarity among the workers, due to the marked class distinction, which gives a serious aspect to the continuance of labor trouble and political difficulty on economic matters.

In our calculations upon the return to normal production and the usual flow of trade, we are constantly forgetting the effect of five years' interruption of the orderly process of peace-time production. Especially is this so in matters relating to the social surroundings, to the necessities, such as housing, furniture, household equipment, shoes, clothing and to other matters in which a normal continual growth of production is required each year in order to satisfy the needs of a growing population. We have been feeling the disturbance and the scarcity of products in the United States, due to about a year and a half of actual war activity. This disturbance is small in comparison with the difficulties encountered in the Allied and enemy countries of Europe, after four years of conflict, in which the whole life of the nations became absorbed in war and war necessities, and all production development except that which belonged to war was practically eliminated. To this disturbance and this scarcity of product must be added the reactions due to the long continued concentration upon the conflict and its abrupt ending, together with the labor conditions which arise partly out of the larger power of labor and partly out of the reaction from the strain of war. This actual dropping behind by the cessation of peace production activity, forms the background for the uncertain conditions in Europe to-day.

Contrary to our general opinion, which assumed that German workers were operating on longer hours and on large production schedules, recent information indicates that the production per man per hour has decreased to a considerable extent in that country, and that the workers are not actually laboring on the longer hour schedule.

In France, the activities of the central organization of labor and the operations of the extreme Socialists have served to keep the brakes on the return of industry to its maximum volume, and it is evident that unrest is an important factor in Italy.

In Great Britain the economic situation continues to be of the foremost political importance, and the complete organization of skilled and unskilled labor is being followed by the rapid organization of clerks, draftsmen, professional workers and others of the salaried class. The extent to which this organization of the black coated workers, as they are called, will affect the situation cannot be determined until they have developed more fully and have outlined their relation with the trade unions.

All labor is so intensely interested in the political question that active campaigns are being conducted by the labor unions themselves for public support of Parliamentary measures which will agree with the program of the Labor Party. In the meantime, the wage decisions do not indicate any reduction in wages; rather the tendency of recent settlements has been further to increase wages. There does not seem to be any inclination on the part of the unions to accept piece-work rates, with the exception of the metal trades industries, where there is some disposition to consider such labor under certain safeguards. In the meantime, the trade unions are working their machinery so as to permit more effective control from the central federated bodies, the new unions among the salaried workers are increasing and experiments in new co-operative movements are taking place.

We have heard a great deal in the United States about the operation of the Whitley Councils, and a good deal of propaganda has gone out with the idea of suggesting something similar for this country. It is interesting to note that the Whitley Councils are not meeting with favor in all districts. In some cases they have been discarded for the old method of dealing directly with the trade unions. In other cases, their decisions are not being adhered to entirely, and there is no evidence that this machinery will be retained or will become an important part of the industrial organization of Great Britain.

An interesting experiment has been suggested in Manchester, which is in the heart of the original co-operative

society district. This experiment has been suggested by the Building Trades Workers and is a return to the old Guild System in which the craftsmen produced the product and marketed it through the Guild.

They have made a proposal to construct houses at 10 per cent gross profit and claim that a saving would be effected. Under ordinary circumstances, this suggestion would not be important but that particular district in Great Britain has shown its capacity for co-operative organization in the past 50 years and no one who has noticed the enormous warehouses along the Manchester Ship Canal, owned by the workers' co-operative societies, can be sure of the failure of this newer experiment, provided it gets a fair opportunity to try itself.

The history of the Guild System is quite interesting in itself and might be worthy of comment at a later date if these experiments justify themselves. The fact that the suggestion has been made and has been received seriously by the Manchester City Council, is indicative of the homogeneous character of the people and the way in which the political and industrial conditions affect the whole approach to the subject of industrial relations.

We have stated from time to time that the question of labor cannot be divorced from the questions usually understood to apply to the social organization. In Great Britain the subjects are so closely allied in the political activities of the labor party that it is utterly impossible to consider the industrial situation without dealing with the social conditions at the same time. It must be remembered that most of the manufacturing centers of Great Britain are located in a climate where there is a large preponderance of gray or cloudy days, where the winter day is very short, and the fog and smoke make it necessary to use artificial light during the majority of days, at least three months in the year.

The housing conditions in these manufacturing cities have not been of the character we would consider suitable for industrial workers in this country. Old methods of building and sanitation obtained right up to the war in most of these centers and the economic position of the worker did not permit of any large amount of comfort or any luxury in his social surroundings. Building was stopped during the war, except as it was required by the government for war purposes and that means that Great Britain is five years behind in building.

We know something about the shortage of houses in this country, where we are less than two years behind through the war requirements. The situation is far more acute in Great Britain where the lack of building for five years has left them short hundreds of thousands of houses for the working population. If these facts are taken in conjunction with the complete organization of workers through their trade unions, the solidarity as a class and the definition of their aims as a political party, the difficulty of getting into production and back to normal working conditions in Great Britain will be appreciated, to some extent at least.

The recent by-elections indicate that the Labor Party is accumulating political strength and it seems not all together unlikely that the dominant power in British politics in the near future would be the labor group. In this case it is to be expected that the political aim of the Labor Party will take precedence over the question of production and in fact it does not seem likely that production can be greatly improved in that country until some of the political questions have been brought before the public and distinctly settled.

As a matter of fact, in all the industrial countries of Europe production will wait to some extent upon political decision. The situation is continually improving, of course, more people are working and more people are staying at work but production on the continuous and definite basis exhibited before the war is not in sight and is not likely to be in sight until some of the acute political questions have been decided.

This does not apply to Belgium, where the suffering of the people under the dominance of the German occupation for several years have had their effect in a unit of desire for the rehabilitation of the country. Such a unity is not exhibited in any other European country.

Prospects for British Automotive Industries

IN the view of a British automobile expert, reported by the American Chamber of Commerce in London, any contrast of the American and British automotive industries is primarily affected by the fundamental difference in the respective home markets. This report, says the Chamber, claims that the unprecedented demand for cars by the American public assures America's market, so that the American industry is justified in embarking on a scale of production that would mean financial suicide for the British manufacturer.

Owing to the scale of production required to meet the home demand, the United States manufacturer, it is said, can in addition produce at such a price as to insure practically 90 per cent of the world's export market for his output. Therefore, as Britain cannot produce cars to compete on cost in the world's markets, the only thing left to the British manufacturer is believed to be in the matter of better design.

But even this stage has not been reached in the British industry, the American Chamber points out. Remarkable efforts will be needed before the British manufacturer can lead America in design, for the reason that during the past five years the American industry has set itself to study design and to embody all that is necessary of such knowledge in its own practice.

The writer contends therefore, says the Chamber, that it is necessary for the British industry to break away from conventional practice if it desires success. For example, if the proposed taxation of passenger vehicles in Britain is based on weight, then a great premium would be placed on designing passenger cars which would be notably light for their accommodation and powers of performance, and quite distinctive from what it would pay the American industry to produce. In this way only, it is claimed, Britain might hope to obtain in the world's market, for products of such exclusive character, the price necessary to ask for them in face of heavy taxation and labor charges.

WITH a view to reducing difficulties connected with pulley sizes and to assist the farmer in operating his ensilage cutters, manufacturers of ensilage machinery have advocated the use of two-belt speeds on their machines—speeds of 2600 and 3000 ft. per minute. This action was taken at a recent meeting of the Ensilage Machinery Department of the National Implement & Vehicle Association at Chicago.

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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1898.

State Industrial Laws and Production

STATE industrial laws are not the most interesting reading in the world and they are not always of instructive value. It is not surprising, therefore, that some laws which might be of aid to the manufacturer, even in actually increasing his production, are not carefully studied. At a time when satisfactory foundry production and turnover seems particularly difficult to obtain, the state laws regarding this phase of industry are of special interest.

Progressive employers are showing an interest in industrial laws as constructive aids to business, not merely as task-masters for managements. The Employers' Association of Detroit has issued a small pamphlet, well indexed and attractively prepared, of the Michigan State Labor Laws. In these, as well as in the labor laws of New York and several other states, are contained provisions concerning foundry conditions that might help the manufacturer in solving his problems.

Too often executives have been content to say, "Well, the foundry is necessarily a dirty and unpleasant place; you can't do much about it." The successful foundries which have been able "to do something about it" and thereby increase production are too well established to allow any doubt as to their success. Many of them have found it a profitable business proposition to go far beyond the requirements of state laws in improving working conditions.

Simply fulfilling in every particular the spirit as well as the letter of laws regarding foundries, however, would vastly improve conditions in a number of automotive plants. The foundry laws in one state, for instance, include this provision: "Whenever a foundry is so constructed or operated that smoke, steam, dust or noxious gases are not promptly carried off by the general ventilation, exhaust fans shall be provided."

This provision evidently implies the actual carrying off of such gases and dust, not merely the installation of fans. One factory advertising manager stated recently that the air in the foundry of his plant was changed five times every hour; the picture he painted of conditions was a glowing one. A visit to that foundry proved that it was impossible during much of the operating time to recognize a man clearly at a distance of twenty-five feet, and that a deep breath was not pleasant in that atmosphere.

Tractor Shows and Parts Makers

IN accordance with a decision of the National Implement and Vehicle Association, four national tractor shows will be held next winter to take the place of the single national show at Kansas City. This solution of the problem was predicted in AUTOMOTIVE INDUSTRIES and seems to be in accord with the wishes of the large tractor makers, who realize the impossibility of drawing dealers from all over the country to a single center. None of the four exhibition cities has been selected, or at least none has been officially announced, but it is a safe guess that Minneapolis and Kansas City will be included in the list. The South is making a bid for one of the shows and may land it, and the fourth no doubt will be held either at Chicago or in some city east of Chicago. In the early discussion of the situation the suggestion was made that one show be held on the Pacific Coast, but, owing to the distance from the centers of tractor production and the limited possibilities for immediate development there, the plan did not seem to meet with much favor.

One large and rather important section of exhibitors at the tractor shows seems to be receiving scant consideration in planning these shows. We are referring to the manufacturers of components such as engines, transmissions, wheels, magnetos, carbureters, air cleaners, radiators, etc. At the recent Kansas City show the list of these equipment exhibitors numbered close to one hundred. A great many of them do business with manufacturers only, and they participate in tractor shows to meet the tractor makers. Naturally, they will not go to all four of the national shows, as that would be a waste of effort. The most accessible show will be selected

by the parts makers, and if Chicago should get one of them there is little doubt but that most of the parts makers would exhibit there. It would be preferable from every viewpoint to make one of them the official parts show, so that the bulk of the products of the tractor parts industry could be seen in one place rather than to have the parts exhibits divided up among the four exhibitions. We cannot expect the N. I. & V. A. to take any action to this end, but the Motor and Accessory Manufacturers' Association might do so.

The Business of Government

THE need of a business government for the United States probably will never be more concisely put before the public than in this statement by the chairman of the House Appropriations Committee; the Hon. James W. Good, has recently made the following statement:

"To-day duplication in the Government service abounds on every hand. For example, eight different departments of the Government, with large overhead organizations, are engaged in engineering work in navigation, irrigation and drainage; eleven different bureaus are engaged in engineering research; twelve different organizations are engaged in road construction; while twelve, with large overhead organizations, are engaged in hydraulic construction, and sixteen are engaged in surveying and mapping. Sixteen different bureaus exercise jurisdiction over water-power development. Nine different organizations are collecting information on the consumption of coal. Forty-two different organizations, with overhead expenses, are dealing with the question of public health. The Treasury Department, the War Department, the Interior Department and the Department of Labor each has a bureau dealing with the question of general education. These departments operate independently; instances of co-operation between them are exceptional. Each of these departments is manned at all times with an organization prepared to carry the peak of the load, and maintains an expensively ready-to-serve personnel. A lack of co-operation in the executive departments necessarily leads to gross extravagance."

Metric System Propaganda

A FEW days ago the American Institute of Weights and Measures learned that a bill had been prepared for submission to Congress to establish, within a limited time, the metric system as the standard of measures in this country and for foreign trade. This bill, as prepared, was ruthless in its requirements as to dates when the change should become effective. Representatives of the Institute persuaded the Representative who was to sponsor the bill to delay its introduction for a short time. In the meantime, the Institute has begun an active campaign against such action.

The metric system campaign is illustrative of the possibility of the influence of one person in this great government of ours. Also, it illustrates how easily this same person may become an international factor, as the campaign is almost as well advanced in Great Britain as it is in this country.

Apparently the campaign is sponsored by the "World Trade Club" of San Francisco. But this club, according to responsible investigators, consists of one man who is personally drafting the leaflets and petitions sent broadcast and who, at last reports, was paying all of the bills. It is said that this man paid $80,000 for one issue of circulars and that he has expended about $500,000 to date in furthering this personal hobby. He has asked for no financial assistance, appearing to spend his money as suits him.

But the situation is becoming serious. It is time that manufacturers were taking stock and looking to their own interests before this mysterious individual forces them to junk their machinery and shop practices and forces them to reform all current practices. The testimony of engineers and mechanics who have worked under metric and inch systems is not all in favor of the metric system. Manufacturers should give some serious thought to this situation and act according to their convictions. AUTOMOTIVE INDUSTRIES is quite certain that such action will not aid the propaganda of the San Francisco propagandist. If you want to study the situation, the American Institute of Weights and Measures at 20 Vesey Street, New York, will be pleased to supply literature.

Foreign Languages

A RECENT report of the Bureau of Commerce stated that a New York exporting house got into legal difficulties in Belgium because of charges that certain goods shipped by the firm to that country had been adulterated. The threat, which was directed against a company official who was visiting in Belgium, was made under a provision of the criminal law relating to obtaining money under false pretences, and the American was almost put into jail. However, it was claimed that the misunderstanding grew out of a mistake in translation and because of the shipper's knowledge of the French language.

The fact that the goods were not what had been expected and that the company placed itself liable to criminal proceedings is important in that it shows the exporters went about their sale without full knowledge. But the more important phase is that the company claimed ignorance of the French language and admitted that ignorance somewhat as a matter of course.

Much has been written and many warnings have been issued by official and semi-official trade organizations about this particular danger. Exporters have been urged to exercise care in the employment of translators and they have been told that they must not do business with a foreign country, especially if the language is different, in a haphazard manner.

But it seems as though the lesson had not been learned everywhere and that some companies at least have not gone into the export field with that full and complete knowledge and effort so characteristic of business dealings at home.

February Exports Create New Marks

Cars, Trucks, Engines and Parts Show Large Gains—Britain Leads Consumers

WASHINGTON, March 26—Another vast increase in automotive exports is displayed in the figures just made public by the Bureau of Foreign and Domestic Commerce, for February, 1920.

Passenger car exports for February totaled 11,221, values at $11,604,622, as compared with 7870 cars worth $8,846,900 shipped in January of this year and as against 3041 cars valued at $3,719,485 exported in February of 1919.

Exports of motor trucks were likewise in great excess over past figures. Shipments for February, 1920, totaled 2889, valued at $4,130,468, as compared with 1721 trucks worth $2,727,856 shipped in January, 1920, and as against 1403 trucks worth $4,270,542 exported in February, 1919.

Motorcycle exports and parts exports showed similar increases. The shipment of parts, not including engines and tires, totaled $7,207,366 for February, 1920, as against $2,699,839 in February, 1919.

Automobile gas engines, marine gas engines and stationary gas engines showed similar increases, while tractor gas engines showed a decrease as against past figures, there being but 1371 tractor gas engines exported at a value of $1,251,547 in February, 1920, as against 1706 worth at $1,500,965 in January, 1920, and against 2245 valued at $2,145,152 in February, 1919.

The United Kingdom was the largest single consumer, taking 1864 passenger cars at $1,963,649 and 410 trucks worth $723,433. Brazil was the second largest purchaser of passenger cars with 1037 valued at $709,184. Brazil was an unusually heavy buyer last month when 400 passenger cars were exported to that country. British India likewise showed a huge gain with purchases from that country of 941 passenger cars valued at $1,073,900; New Zealand with 903 cars at $1,025,587; Canada with 805 cars worth $921,168. Australia, Cuba, Uruguay, Spain, British Africa, and Denmark were next in the order named.

The figures are shown on this page.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for February and Seven Previous Months

1920	Cars No.	Cars Value	Trucks No.	Trucks Value	Motorcycles No.	Motorcycles Value	Parts Value
February	11,221	$11,604,622	2,889	$4,130,468	3,449	$920,403	$7,207,366
January	7,870	8,846,900	1,721	2,727,856	2,398	664,288	4,778,626
1919							
February	3,041	3,719,485	1,403	4,270,542	1,298	283,867	2,699,839

	February 1919 No.	February 1919 Value	February 1920 No.	February 1920 Value	Eight Months Ending February 1919 No.	Eight Months Ending February 1919 Value	Eight Months Ending February 1920 No.	Eight Months Ending February 1920 Value
Airplanes	2	$15,000	3	$44,000	43	$577,600	39	$206,480
Airplane parts	....	329,129	....	6,494	....	9,546,241	....	221,760
Commercial cars	1,403	4,270,542	2,889	4,130,468	7,721	21,307,605	12,675	23,687,512
Motorcycles	1,298	283,867	3,449	920,403	5,539	1,302,633	19,814	5,433,794
Passenger cars	3,041	3,719,485	11,221	11,604,622	19,523	22,333,972	59,290	63,997,450
Parts, not including engines and tires	....	2,699,839	....	7,207,366	....	22,451,246	....	34,674,019

Exports of Engines

	February 1919 No.	February 1919 Value	February 1920 No.	February 1920 Value	Eight Months Ending February 1919 No.	Eight Months Ending February 1919 Value	Eight Months Ending February 1920 No.	Eight Months Ending February 1920 Value
Automobile, gas	551	$103,219	3,315	$488,421	15,754	$2,470,796	24,182	$3,634,090
Marine, gas	457	315,085	550	245,504	3,784	2,102,448	5,889	2,158,090
Stationary, gas	1,598	255,538	1,905	308,234	15,153	2,163,037	17,467	2,405,216
Tractor, gas	2,245	2,145,152	1,371	1,251,547	14,568	16,169,936	11,574	10,395,496
Total	4,851	2,818,994	7,141	2,293,706	49,259	22,906,217	59,112	18,592,892

Exports of Cars and Trucks by Countries

	February, 1920 Cars No.	February, 1920 Cars Value	February, 1920 Trucks No.	February, 1920 Trucks Value	Eight Months Ending Feb., 1920 Cars No.	Eight Months Ending Feb., 1920 Cars Value	Eight Months Ending Feb., 1920 Trucks No.	Eight Months Ending Feb., 1920 Trucks Value
Denmark	347	$328,004	96	$208,662	1,940	$2,221,891	548	$1,192,214
France	87	133,637	80	261,622	672	928,337	1,362	5,784,463
Norway	109	135,282	98	163,200	1,452	1,826,205	582	1,134,153
Sweden	105	141,540	....	....	1,631	2,230,249	....	....
Spain	329	446,921	....	....	1,417	1,815,469	....	....
United Kingdom	1,864	1,963,649	410	723,433	8,681	9,225,857	1,839	2,868,974
Canada	805	921,168	158	265,398	5,703	6,729,564	1,276	2,135,504
Mexico	245	172,060	94	123,754	1,926	1,571,167	674	813,654
Cuba	421	389,703	186	346,401	2,370	2,386,969	774	1,601,628
Argentina	237	245,319	15	35,708	1,592	1,887,681	117	209,391
Chile	72	104,814	....	....	191	291,478	....	....
Uruguay	415	361,188	....	....	1,484	1,372,162	....	....
British India	941	1,073,900	....	....	3,065	3,368,740	....	....
Dutch East Indies	142	193,767	101	219,002	977	1,235,607	305	653,134
Japan	212	165,532	140	80,125	1,535	1,444,498	459	492,457
Australia	520	596,450	....	....	2,807	3,046,002	....	....
New Zealand	903	1,025,587	....	....	3,228	3,629,535	....	....
Philippine Islands	102	133,795	19	36,851	1,460	1,605,537	383	563,508
British South Africa	387	438,823	....	....	2,683	3,003,434	....	....
Brazil	1,037	709,184	....	....	3,716	2,784,474	....	....
Peru	148	154,689	....	....	545	483,734	....	....
China	45	73,187	18	27,269	494	659,422	119	297,466
Other countries	1,788	1,696,423	1,207	1,238,862	9,721	10,249,438	3,582	4,890,958
Total	11,221	11,604,622	2,889	4,130,468	59,290	63,997,450	12,675	23,687,512
British Oceania	....	....	267	400,181	....	....	655	1,050,008

Foreign Opportunities

WASHINGTON, March 27—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity Number.

An importing firm in France desires to secure representation of firms for the sale of automobile supplies. References. 32337.

An agency is desired by a man in France for the sale of the device commonly known as "motor wheel" to be attached to a bicycle, transforming it into a motorcycle. Quotations should be given c.i.f., French port. Correspondence may be in English. 32341.

A firm of importers in Syria desires to be placed in communication with exporters of all kinds of automobiles and trucks. 32349.

A company in England desires to secure an agency for the sale in India and China of motor cars. Quotations should be given f. o. b. New York. Payment in United States under letter of credit against documents. Reference. 32352.

A firm of commission agents in Argentina is interested in securing agencies for manufacturers of automobiles. Correspondence should be in Spanish. References. 32355.

A merchant in Syria desires to secure an agency for the sale of automobiles, such as touring cars, passenger cars, roadsters, runabouts and trucks. References. 32374.

A motor car company in England desires to purchase low-priced motor cars and trucks. Quotations should be given c.i.f. Liverpool. Payment by credit in New York. References. 32375.

To Start Lakes Air Service May 1

Former Aviation Officers to Operate Fleets Between Great Lakes Cities

DETROIT, March 26—The United States Aerial Express will start commercial service between Detroit and Cleveland May 1. Two Curtiss seaplanes will be put on regular schedule, and the company plans a similar service between Detroit and Toronto, and Detroit and Buffalo with two planes each, the latter to start June 1, and the Toronto line about June 15.

The company is headed by Thomas F. Dunn, a former army aviation officer, and Jean Servantie, of the French Flying Corps.

In addition to the two plane units operating between Detroit and the three lake cities there will be one through line, which will touch at all four cities, and which is designed primarily to care for overloads, or to pick up traffic in the event of interruption to one of the direct units operating between two cities.

In addition to the planes operated in the commercial field there will be ten planes distributed at Cleveland, Detroit, Buffalo, Put-in-Bay, Port Huron, Toronto and Toledo for novelty purposes by the company.

Although nothing can be given out definitely the company is said to be assured of the mail contract between Detroit and Cleveland, and the planes will be equipped to carry mail and passenger baggage, making the trip to Cleveland in about 75 minutes. It is the plan to make the 75 minute schedule take a passenger from a hotel in Detroit to the center of Cleveland. The planes, of course, will start and stop in the river and lake, and passengers will be taken out in a dinghy.

In addition to the passenger service a night express service will be maintained for carrying registered mail, clearing house receipts and other important matter. The express planes will be capable of carrying 5000 pounds. The planes which are so equipped that they can make from 50 to 60 miles an hour on the water are 105 ft. spread.

Commercial Possibilities Great

Lieut. Dunn said to-day the passenger rate had not been definitely fixed. Business men enthusiastic over the proposition from its commercial advantages have urged a high rate, in order to minimize the traffic that doubtless will be attracted. The schedule calls for one round trip each day in either direction, but it is possible to make eight, Dunn said, if patronage demands.

The company will operate throughout the year, the planes being equipped to land or travel on ice, as well as water. Absolute safety to passengers is assured, and the cabins are so constructed that they are as nearly sound proof as possible. They are carpeted, well ventilated and equipped with electric lights, the hull construction being such that a forced landing even on the ground would hardly shock the passenger, though it might ruin the hull.

Dunn, who has been active in aviation circles in Detroit since the armistice, has made the trip in a small battle plane, and has taken scores of business men on hurried business trips to Cleveland during the last few months.

Agree to Lengthen Hours

ANDERSON, IND., March 26—Officials and employees of the Remy electric division of General Motors Corp. have agreed upon a schedule of longer working hours to increase production for the company and better wages for the employees. About 4000 men and women employees entered into the agreement. The new system replaces the two-shift plan alternating between day and night turns on an eight-hour basis. The rotating shift plan, which was an experiment, was said to be unsatisfactory to both management and employees.

Under the new system a small night force will be retained for repairs and special work, and employees will have the choice of an hour for luncheon on their own time, or a short period off with pay. Those taking advantage of the latter plan will draw ten hours' pay. All of the employees will be off duty after 12.15 on Saturdays. The same system, which is in operation at the plant of the American Steel & Wire Co., has been working satisfactorily.

Rolls-Royce Production Delayed Until Fall

SPRINGFIELD, MASS., March 30—Offices of the Rolls-Royce Co., which acquired the East Springfield plant of the Wire Wheel Corp. of America, last December, are to be located at the plant after April 1. Pending alterations, temporary offices have been occupied in this city.

Treasurer H. C. Beaver of the corporation states that the Government has already vacated a large part of the East Springfield plant and that the Rolls-Royce machine tool equipment is being installed for the manufacture of sundry small tools to be used later in the manufacture of the Rolls-Royce automobile. Raw material for manufacture is also being received.

Though the officials hope to begin the manufacture of auto chassis in about six weeks, it is not expected to complete the manufacture and assembling of any of the cars before fall. The entire car is to be built at the local plant. Between 100 and 150 are now employed at the plant. Increase to at least 1000 by fall is expected.

15,000 Automobiles Await Car Service

N.A.C.C. Committee Presents Need for Immediate Facilities to Railroad Heads

NEW YORK, March 30—Strong arguments which it is hoped will produce a more adequate supply of cars for the automotive industry have been presented to the Car Service Commission in Washington by the Traffic Department of the N. A. C. C. It has been pointed out that the next three months constitute the heaviest shipping season of the year.

There now are stored more than 15,000 automobiles and trucks in the Michigan-Toledo zone awaiting shipment. This represents approximately $21,000,000 borrowed to finance this business pending shipment and delivery.

The traffic department has made these recommendations:

That car service rules be augmented to require that all automobile cars, until further notice, must be forwarded at once to Ohio, Indiana and Michigan, empty, unless loads to destinations in those States are immediately available: this is not to be construed as interfering with the loading of cars with automobiles at points outside of Ohio, Indiana and Michigan to any destinations so long as car service rules are observed in the routing of such loads.

That reports to the car service section be required of Eastern, Southern and Western roads to show compliance with this order.

That home routing of cars used for the shipping of automobiles or trucks will be required of automobile shippers.

That the Michigan Central, Pere Marquette, Wabash, Grand Trunk and New York Central keep a daily record showing the number of carloads of automobiles delivered their principal Western and Southern connections and the number of automobile cars received from those same connections.

That the car service section at once assign a representative to be located at Detroit to observe the compliance with the rules, to receive reports from railroads and shippers and to assist in the administration of the plan.

M.A.M.A. SEEKS TAX REVISION

NEW YORK, March 28—The Motor and Accessory Manufacturers' Association has joined the Business Men's National Tax Committee and will lend its aid to efforts which are under way to bring about revision of the Federal tax system. The committee will urge upon Congress prompt repeal of the excess profits tax as well as revenue and stamp taxes. It proposes as a substitute a gross sales or turnover tax as well as a graduated personal income tax with an increase in personal exemptions. The subject will be considered at the meeting of the Chamber of Commerce of the United States at Atlantic City next month.

General Purchases Demonstration Site

Will Show Tractors and Farm Equipment on Old Jersey Fair Grounds

NEW YORK, March 27—General Motors Corporation has bought the Monmouth County Fair Grounds, at Red Bank, N. J., as a site for a demonstration and distributing plant for tractors, electrical devices and lighting plants adapted for farm and rural residences.

The property consists of 60 acres and is located on both the Pennsylvania and Jersey Central railroads, just north of the Red Bank station. The grandstand, stables and frame buildings now on the property will be razed to make way for the demonstration buildings.

Among other buildings to be erected will be a complete model farmhouse, equipped with a "Sunnyhome" electric light and power plant, one of the corporation's products. William C. Durant, president of General Motors, whose summer home at Deal Beach is just a few miles south of the new property, will give its development his personal supervision.

The manner in which the demonstrations will be carried out has not been fully determined, according to W. W. Murphy, secretary to President Durant. It will take some time to get the property into the desired condition, and until that time plans will be somewhat indefinite.

CLUB TO FEATURE AVIATION

DETROIT, March 27—Temporary directors of the Aviation Country Club, the organization which took over the Flanders estate of 823 acres surrounding Green Lake, has made the initial payment on the tract, and permanent organization will be perfected immediately. Included in the prominent men who compose the temporary directors are: H. M. Leland, of the Lincoln Motor Co.; C. B. Bohn, of the Bohn Foundry Co.; Colonel Sidney Waldon; C. W. Dickerson, of the Timken-Detroit Axle Co. and a number of leading figures in the automotive industry.

One of the chief features of the country club will be aviation, the grounds of the big estate furnishing an ideal flying field.

KARWISCH OPENS NEW PLANT

ATLANTA, March 26—The new plant of the J. M. Karwisch Wagon Works, manufacturers of the Karwisch lines of commercial truck bodies, has now been completed in Atlanta and manufacturing work has started in the plant. The old plant at 81 East Hunter Street has been discontinued. The present plant is twice as large as the old one, and provides more than double the capacity.

This company makes a specialty of manufacturing commercial truck bodies adapted to the particular needs of the buyer and also makes a full line of bodies for all standard made chassis. A great deal of the machinery installed in the new plant was invented by John M. Karwisch, president of the company, to serve the particular needs of this concern. Robert C. Hackman is the vice-president of the company.

The present plant provides 33,000 sq. ft. of floor space.

Designs New Plane

LOS ANGELES, March 27—Showing something which is believed to be unique in airplane construction, D. V. Cole, for two years instructor in aeronautics at University of California, is here with a plan to establish an aerial transportation system between this city and San Francisco. Cole has designed a hydroplane using two biplanes hitched 64 feet apart on an underslung body, which serves as the pilot's pit and passenger coach. The body is 142 ft. long and 8 ft. high. The passenger capacity is 60. The wings have a spread of 126 ft. with a 14-ft. gap between. Six 400 hp. Liberty motors would be used. A speed of 100 miles an hour is claimed for the machine.

AERONAUTIC CONGRESS SET

NEW YORK, March 29—The Aero Club of America announces that the third American Aeronautic Congress will be held at Atlantic City from May 20 to 30. Before deciding on the extent of the contests the committee will wait to be assured there will be pilots and machines to compete for all the prizes which are offered.

Planes for Exploration

NEW YORK, March 27—Latin America is an open field for aircraft made in the United States, according to Francesco Yanes, assistant director general of the Pan-American Union. While this trade naturally belongs to Americans they must take advantage of their opportunities with reasonable promptness or they may expect foreign competitors to take it away from them.

Señor Yanes emphasized the need for airplanes in South America to discover unknown interior territory, rich lands hidden in inaccessible regions, and exploration generally.

GREYHOUND BUYS PROPERTY

NEWARK, N. J., March 29—The Greyhound Motor Car Co. has purchased 15 acres at East Warren, R. I., and will erect a plant for the building af automobiles. The initial unit will be of brick, 80 x 100 ft. In the meantime the company is expected to lease a factory in Warren for the making of parts.

Air Service Forms Code-of-the-Air

Lighter-Than-Air Craft Have Right of Way—Provide Passing Rules

WASHINGTON, March 26—In the absence of Federal legislation of any kind governing flying in this country, the Air Service has formulated general rules of the air as a guide to pilots. In anticipation of what will be eventually enacted, the standard regulations and rules of the air adopted by the Army Air Service are made public.

As the Automobilist must know the rules of the road, so the aviator must know the "Rules of the Air." These, as well as the words of precaution to pilots and instructions for flying and landing after dark, conform closely to the International Air Convention, one of the products of the Peace Conference.

The General Rules of the Air provide that:

No pilot shall fly closer than 200 yds. to any dirigible, free or captive balloon.

Lighter-than-air craft will at all times have the right of way over the heavier-than-air craft.

A motor-driven aircraft must always maneuver according to these rules as soon as it is apparent that if it pursued its course it would pass at a distance of less than 200 yds. from any part of another aircraft.

When two motor-driven aircraft are meeting end on, or nearly end on, each shall alter its course to the right.

Where, by any of these rules one of the two aircraft is to keep out of the way, the other shall keep its course and speed.

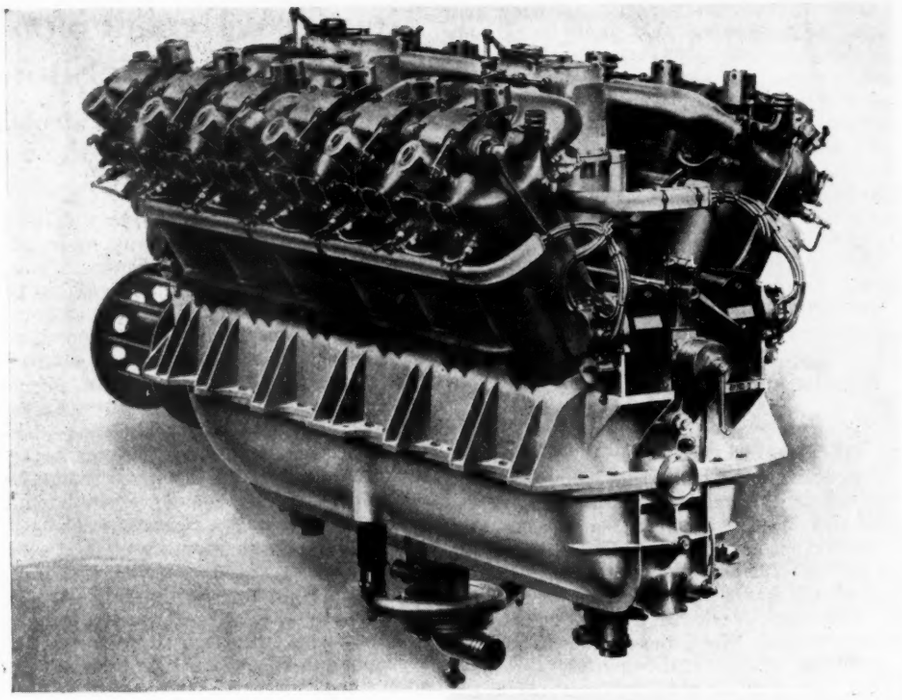
Every aircraft which is directed by these rules to keep out of the way of another aircraft shall, if the circumstances of the case admit, avoid crossing ahead of the other.

APPEAL OHIO TAX LAW

CLEVELAND, March 26—Holding that the newly-enacted Ohio graduated automobile license law is contrary to the Fourteenth Amendment to the United States constitution, the board of directors of the Ohio Automobile Association has unanimously voted to carry the case to the United States Supreme Court. An adverse decision was given in the Ohio Supreme Court recently. It is claimed that the law in question amounts to double taxation and thus is opposed to constitutional principles.

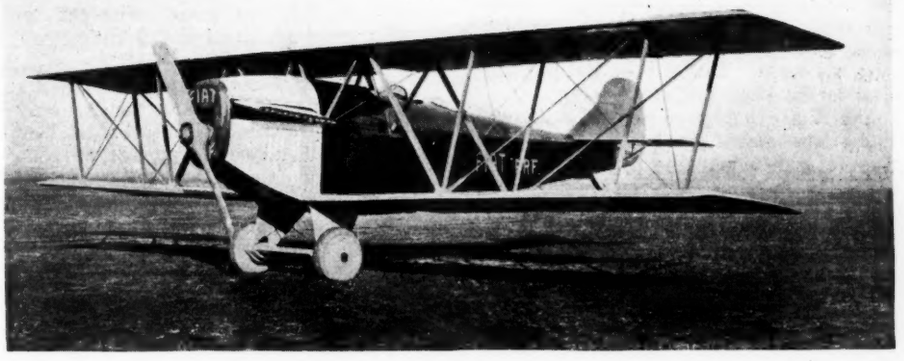
INDIA LIKES AMERICAN CARS

NEW YORK, March 26—A résumé of the foreign trade of British India for the period from 1907 to 1919, inclusive, shows that the United States held undisputed first place in the importation of motor cars. The market for automotive products in that country is steadily widening and the prospect for large sales by American manufacturers are said to be better than ever.



This Is the Fiat Engine and Plane Designed for Transatlantic Flights

The plane, called the A. R. F., was completed February 26, at Turin. In a trial flight driven by Lieut. Frencesco Brak Papa, it attained a speed of 261 kilometers an hour, with four passengers aboard. The engine is of 700 hp. Fuel sufficient for 20 hours is carried — almost enough for a round trip across the ocean



Portable Airplane Cranker Now in Use

WASHINGTON, March 29—A portable airplane engine cranker, designed by the Equipment Section of the Engineering Division, McCook Field, is now in use at this field. This starter can be accommodated to all types of engines by using suitable face plate castings. The engine cranker is driven by an automobile starting motor with storage battery, and exerts sufficient torque to spin a cold Liberty 12 engine at 40 r.p.m.

The cranker now in use at McCook Field is mounted on a 1½-ton Packard truck. The truck is driven to a position in front of the airplane, and the cranker is swivelled in the universal bowl so that its shaft approximately parallels the propeller axis. The automobile release is set at the starting position, and the engagement lever is then pushed forward until the face plate nearly touches the propeller. The necessary adjustments of the elevating and transversing mechanisms are then made and the bowl clamped in position. The engagement lever is then pushed forward so that the face plate engages the propeller hub nuts, and the starting switch is operated.

As soon as the engine starts under its own power, the face plate automatically recedes from its engagement with the propeller hub nuts, leaving the entire starter clear of the propeller, thereby allowing the starter truck to drive away without danger of interference.

TO PROBE GASOLINE PRICES

WASHINGTON, March 29—Favorable report was ordered by the Judiciary Committee of the House of Representatives yesterday on the Dyer resolution, directing the Attorney General to make an immediate inquiry into the recent advances in the price of gasoline, kerosene and other petroleum products. The committee recommends a report to Congress by June 1.

Consideration of the sources of supply, profits of the oil business and whether any combination exists to restrain trade and regulate prices, will be undertaken.

WITHERBEE ADDS TO OUTPUT

NEW YORK, March 29—The Witherbee Storage Battery Co. has increased its production by the erection of an additional factory in New York and another at North Bergen, N. J. All the parts used in the batteries are made in the company's factories.

Grant Buys Control of Walker Engine

CLEVELAND, March 26—Announcement was made here to-day the Grant Motors Corp. has purchased a controlling interest in the H. J. Walker Mfg. Co. At the office of the Grant company it was stated that the management of the Walker company changed hands last Tuesday with the personnel of the plant practically unchanged.

The Walker Mfg. Co. has a capital of 100,000 shares, no par value, which is selling at $25 per share. The Grant company bought the stock owned by H. J. Walker, organizer and heretofore owner of the controlling interest.

The plans of the Grant company with reference to the new plant have not been completed but for the present motors and certain auto parts will be produced. The capacity is 150 engines daily and the Grant company will take 80 of them. The remainder will be sold. In addition, the jobbing work will be continued.

Four hundred are on the payroll of the Walker company and the plant is located near that of the Grant Motors Corp. so that the finished products of the former plant can be put into Grant cars with little moving expense.

French Racing Cars Near Completion

Peugeot, Ballot, Fiat, Porporato Soon to Test Models for Indianapolis

PARIS, March 13 (*Special Correspondence*)—The first of the 183 cu. in. Peugeot racers built for the Indianapolis Sweepstakes was taken on the road this week by André Boillot. The tests proved satisfactory, for the car was as fast as the 300 cu. in. Peugeots built before the war. The two other Peugeot racers will be on the road next week. Drivers of the Peugeot cars will be Jules Goux, André Boillot and Wilcox.

Ballot has definitely selected his team for Indianapolis, the drivers being Ralph De Palma, Jean Chassagne and René Thomas. The Ballot cars have eight cylinders in line. They are almost completed and will be on the road next week. It is possible that Ballot will enter a fourth car, of only 122 cu. in. cylinder capacity. This machine is not expected to win, but is capable of making a fine demonstration of speed and regularity. M. Ballot, the builder of these cars, intends to come to America with his team. This will be Ballot's first visit to the United States.

The Fiat racing engines for Indianapolis are stated to be on the bench. It is not yet known whether the cars will be ready in time for the Indianapolis trials.

Jean Porporato is preparing two cars for Indianapolis. He will drive one of these himself and give the other to Jack Scales, an Englishman formerly on the Fiat racing team. Porporato has completed his bench tests and will have his cars on the road at the end of the month.

Racing cars of 183 cu. in. capacity are being built at the Mercedes factory, in Germany. Pilette has made arrangements to secure one of these and will race at Indianapolis.

PATENT SUIT SETTLED

NEW YORK, March 26—The suit which was brought by the J & B Mfg. Co. against the Gray-Heath Co. for infringement of the Jacobson patent for a timer for Ford cars by the timers made by the Cuno Engineering Company has been settled.

The Cuno company has taken a license from the J. & B. Co. and will continue to manufacture timers under this license. Further suits against other infringements will be brought.

SWEDEN WANTS TIRES

WASHINGTON, March 29—There is a great demand for automobile tires in Sweden, with American tires predominating, according to a report from Consul Sholes to the Bureau of Foreign and Domestic Commerce received recently in this city.

Extensive contracts are being let in anticipation of the opening of the new motoring season. Competition is keen, with all the leading brands represented. Swedish motorists prefer hand-made tires as being more suitable to the road conditions. Costs play an important part in sales, but there is a considerable market for high-priced tires. In 1916 tires were imported from Great Britain to the value of $151,500; from France, $106,680, and from the United States, $34,690. There is a good opportunity at present for the American tire exporter.

Owing to the increased sales of motor cars in recent months, the demand for accessories and spare parts of all kinds far exceeds the supply.

Sunbeam Engine Sets Motor-Boat Record

NEW YORK, March 29—Installed in a French motor boat, the Sunbeam Despujols engine, recently introduced in this country in the Sunbeam car, broke the world's speed record for motor boats at a private trial on the Seine, near Paris, on March 23.

The trials were carried out on a 500-meter course where the current is slight, and the official chronometers recorded that this was covered in from 14 to 16 seconds at different trials. The general speed may be set down as 120 kilometers, or 75 miles an hour.

The Sunbeam motor used in making this record is 450 hp. and weighs only 1700 kilos. Naval constructors have held that a propeller turning more than 1800 revolutions a minute would produce a vacuum about itself and in consequence fail to secure speed. The inventors of the new record-breaker, however, have disproved this theory and used a multiplicator which produced 3000 revolutions a minute.

This Sunbeam motor was of the same type as those used in the British R-34, which crossed the Atlantic last summer.

TO BUILD STANDARDIZED BOATS

NEW YORK, March 29—The Burger Boat Co. of Manitowoc, Wis., will build a standardized stock motor cruiser, 30 ft. long, of the Everybody's Motor Boat type. Designs have been prepared and manufacture will be started as soon as materials can be obtained.

Three other companies already are turning out standardized boats. They are the International Shipbuilding & Marine Engineering Corp. of Nyack, N. Y., which uses Kermath engines; the Elco works of Bayonne, N. J., which uses J. V. B. engines, and the Red Bank Yacht works at Red Bank, N. J., which uses the Red Wing Thoroughbred engine.

The Huss Motor Co. of Detroit has put on the market a marine motor single cylinder engine in which it is using Ford parts.

KARDELL PRODUCTION GROWS

ST. LOUIS, March 29—The Kardell Tractor & Truck Co. announces that it is now producing at the rate of 15 machines a week and expects to increase the number to 10 a day by July 1. Felix Garnier has been appointed assistant general salesmanager, and Nelson B. Nelson of Racine, Wis., superintendent.

Reaffirm Decision on Paris 1920 Show

Junior Manufacturers Threaten to Hold Show of Own—Plead Lack of Production

PARIS, March 13 (*Special Correspondence*)—By twenty-two votes to fourteen the French Syndicate of automobile manufacturers, which corresponds to the Automobile Chamber of Commerce, has voted against the Show in Paris in 1920. This merely confirms the vote taken by the presidents of all the trade organizations interested in the Paris Salon a few weeks ago. The Chambre Syndiacle is the most powerful of the trade organizations in France, for it controls practically all the automobile manufacturers of that country.

The minority is very dissatisfied with this decision and threatens to take such action that an automobile show will be held despite the vote. It is claimed by this minority that the 1920 show has been abandoned in order to prevent the younger firms from gaining a footing in the world's market. If the minority in favor of a show breaks away from the majority, it will be practically impossible for them to secure the Grand Palais in the Champs Elysées. This, however, will not prevent them from holding a show in some other central hall in Paris if they so decide.

The main argument of the majority is that they have not yet got into production on the models exhibited in 1919, and will only have begun production on an important scale by the end of the summer of 1920.

They claim, therefore, that they will have nothing new to exhibit and that there is no necessity for a show which would be nothing more than a repetition of last year's exhibition. There is a strong hope among the anti-show section that England and Belgium will follow their decision. It is practically certain that neither London nor Brussels will consent to abandon their shows. A keen fight is expected on the Paris show question.

DECREASE IN FRENCH CARS

PARIS March 13 (*Special Correspondence*)—There are 94,884 passenger-carrying automobiles in France, according to official figures just issued. In 1914 the number was 107,535. These figures must not be accepted as an indication of the total number of automobiles in France. The official returns only cover privately-owned passenger cars which have paid taxes, no account being taken of trucks, taxicabs, motorcycles, motor omnibuses or cars engaged in private hiring business. It is certain that there has been an enormous increase in the number of trucks in service since the war, but no official figures are available regarding these.

The district of France which has the greatest number of cars is Paris, with 16,089; the Rhone district, including Lyons, has 3027 cars.

Elmer Apperson Dies Suddenly

Head of Apperson Company Is Stricken While Watching Los Angeles Races

LOS ANGELES, CAL., March 28—Elmer Apperson, senior member of the firm of Apperson Brothers' Automobile Co. and one of the country's pioneer automobile manufacturers, was stricken with heart disease while attending the automobile races at the speedway here today and died within a few minutes. Mr. Apperson was 58 years old and is survived by his widow and two brothers, Edgar and Oscar.

Mr. Apperson, his wife and a party of friends were occupying a box at the speedway when the stroke came. He had been here two months combining a visit for his health with the opening of the new building occupied by his factory branch. He suffered a stroke of paralysis about three years ago and his health had been impaired ever since.

About two years ago he withdrew from the active direction of his company, placing the management in the hands of his brother, Edgar, but retaining his position as president of the company. The body will be removed to Kokomo, Ind., the family home and location of the Apperson factory.

The Apperson brothers, who supplied the factory facilities for the building of Elwood Haynes' early cars, were associated with him for many years in commercial production. Elmer Apperson and his brothers invested time, money and reputation in the development of Haynes' ideas at a time when such investments were generally held to be legitimate reasons for cancelling bank credit.

Although differences subsequently arose between the partners it does not becloud the fact that the Appersons had a very definite hand in developing the first real automobile. It also is an unquestioned fact that the product of the Apperson company has played an important part in popularizing the automobile from pioneer days to the present.

OVERLAND PRICES GO UP

DETROIT, March 29—Increases on Overland and Willys-Knight open models have been announced. Overland Four, both touring and roadster have been advanced $40. Willys-Knight touring and roadster have been advanced $275. Overland prices now are $985 f.o.b. factory, and Willys-Knight, $2,250. No increases were announced on closed models.

WOULD CLEAR STATE ROADS

ALBANY, N. Y., March 30—The Senate Internal Affairs Committee is expected to make a favorable report soon on the bill of Senator Yelverton of Schenectady providing for the removal of snow from State roads in winter to permit uninterrupted motor traffic. No opposition developed at the recent hearing on the bill, which was favored by automobile associations throughout the State. The bill authorizes boards of supervisors to designate roads from which the snow is to be removed and to make appropriations from county funds for removing it. The estimated cost of removal in normal winters is $10 a mile, but the cost of removing accumulated snow the past winter on the road between Albany and Schenectady has been more than $50 a mile, which was paid for by the two cities.

Racing Driver Wants Berth

NEW YORK, March 30—Who's in the market for a racing car driver?

A. Guyot, one of the famous French drivers, is looking for a job, according to his friends in this city. He was in the big Indianapolis race last year and wants to get in again. He is still in France but is eager to come to the United States if he can get an opportunity to show his skill as a racer.

Five Sessions Chosen for S. A. E. Summer Meet

NEW YORK, March 29—The program for the summer meeting of the Society of Automotive Engineers, which will be held at Ottawa Beach June 21-25, inclusive, was announced to-day. It follows:

Monday, June 21—Standards and Business Session.

Tuesday, June 22—Fuel Session.

Wednesday, June 23—Transportation Session.

Thursday, June 24—Farm Power Session.

Friday, June 25—Production Session.

One professional session will be held each day. A list of sports and recreations which "will eclipse last year" is promised, with lectures and dancing each evening.

TO BUILD IN SINGAPORE

AKRON, March 29—The Keystone Tire & Rubber Co. announces that it has made plans for the construction of a $1,000,000 plant in Singapore by a subsidiary company. The plant will condition the rubber direct from the Straits Settlements plantations and will compress it to make transportation easier and less costly.

GOODYEAR LEASES COAL LAND

AKRON, March 29—A lease on 5200 acres of coal land in Ohio, owned by J. H. Somers Coal Co., Harrison City, Ohio, has been taken by the Goodyear Tire & Rubber Co. The company has the option of purchasing at the expiration of the lease. Mining operations will be conducted under the name of the Wheeling Township Coal Mining Co.

Form Committee to Aid Transportation

Automotive Makers to Serve in Promotion of Highway Development Projects

WASHINGTON, March 29—A Committee on Transportation will be organized by the Federal Highway Council, this city, on April 5, when approximately forty representatives of the motor car industry, automotive publications, chamber of commerce, fleet operators, tire companies and various organizations and associations related to the highways, will meet at the office of the council.

The purpose of the committee will be to co-ordinate the various highway interests with general transportation interests. Representatives will be present from the public, from the motor truck industry, from farm interests, and to represent general business. It is expected that the meetings which will take one day, will result in the appointment of various subcommittees handling different problems related to highway transport, which will take up these problems at later times in their various localities of the country.

Further, the committee, which it is expected will work with the Transportation Bureau of the Federal Highway Council, will attempt to realize the needs of road users, visualize future highway transportation requirements, co-operate with railroads and waterways, and study all of the many problems attending the entrance of the motor truck into commercial life, encouraging establishment of motor express lines and generally stimulate the use of highways.

A curious fact in connection with construction problems at the present moment, is that the building of roads is seriously hindered by the same evil which they are designed to remove—lack of transportation. According to authoritative information, production is halted to a greater degree by inadequate transportation facilities than by labor shortage. At least this is true, it is claimed, in the production of materials for road building.

PATRIOT TO MAKE CARS

LINCOLN, NEB., March 29—The Patriot Motors Co., a reorganization of the old Hebb Motors Co., has been incorporated with a capital of $10,000,000. It is proposed to erect three or more new buildings on the company's tract at Havelock and eventually employment will be given to more than 2000 persons. The company proposes to branch out into the production of passenger cars.

The incorporators are A. G. Hebb, E. C. Hammond, L. A. Winship, K. W. Gillispie and A. H. Armstrong. The company now has representatives in Canada, Mexico and almost every country in South America and contemplates the development of foreign markets for its trucks.

Association to Aid Farm Motorization

Truck Makers to Be Called in Convention to Discuss Plans

NEW YORK, March 30—Motorization of the farms in the metropolitan district, virtually a virgin field, has been undertaken by the Motor Truck Association of America. A convention of manufacturers, dealers, bankers and farmers will be called at the Waldorf-Astoria soon to develop interest in the project and outline the possibilities of the truck and tractor in the great garden areas which supply Greater New York and New Jersey cities with fresh vegetables and dairy products.

The first step will be an intensive educational campaign. When farmers and dealers are alive to the advantages of motorization an actual outdoor demonstration will be given on a large farm in the borough of Queens, actually within the city limits. Not only will trucks and tractors show what they can do under expert direction but all kinds of modern agricultural machinery will be put through their paces.

Dealers in the metropolitan area have paid practically no attention to the development of trade in the agricultural communities which lie almost in front of their doors. Some trucks are in use on the nearer end of Long Island but in the more remote sections they are seldom seen hauling produce to market. Farmers and market gardeners have not been sold on the possibilities of economies and increased profits which would result from their use. The same is true of tractors to an even greater extent. Similar conditions prevail in Westchester county and in New Jersey.

COMPLETE PARTS FACTORY

CHICAGO, March 27—In spite of severe winter weather, the Chicago factory of E. Edelmann & Co., manufacturers of automobile parts, will be completed April 15. The building, which is considered the first unit, is 217 x 725 ft., with the main line of the Chicago, Milwaukee & St. Paul Railroad at the rear. The factory will have all provisions for the welfare and comfort of employees. No artificial lights will be used.

A branch factory will be opened at Walkerville, Ontario, May 1.

MERGER TO BE RATIFIED

NEW YORK, March 27—Special meetings of the stockholders of J. H. Williams & Co., at Brooklyn, N. Y., and of the Whitman & Barnes Manufacturing Co., at Akron, Ohio, have been called for April 2, to ratify an agreement entered into by their presidents for the merging of the Chicago and St. Catharines, Ontario, plants of the Whitman & Barnes Manufacturing Company with J. H. Williams & Co.

When ratified this plan will contemplate the operation by J. H. Williams & Co. of drop forging and drop forged tool plants at Brooklyn, Buffalo, N. Y., and West Pullman, Chicago, and at St. Catharines. The business will be operated by the individuals now connected with these plants.

The Whitman & Barnes Company's Chicago plant includes the new forge shop, 100 x 500 ft., and a large power house which has just been built. Whitman & Barnes will continue its business of making twist drills, reamers and collateral lines on an extended scale at Akron.

Prizes for Coal Gas Fuels Are Withdrawn

LONDON, March 11 (*Special Correspondence*)—The Automobile Association in 1918 offered a prize of $5,000 for the best system of enabling coal-gas to be used as a vehicle fuel. At that period it seemed likely that coal-gas would "take on," as, apart from the shortage of gasoline and other liquid fuels. Inventors had brought out plants for compressing and storing the gas in bottles, and it was thought that a system of interchangeable gas-containers would be set up in connection with garages, after the model of the dissolved acetylene system.

A wide publicity at home and abroad was given to the scheme, and a number of competitors were attracted, of which eleven were found to conform with the conditions as laid down. They were notified to forward their plants, etc., for testing, but none arrived. The competition was then extended to last autumn, but again without success, and now the offer has been withdrawn.

ENGLISHMAN.

CANADA ORDERS TRACTORS

PORT WASHINGTON, WIS., March 29—The Turner Mfg. Co., manufacturer of Simplicity gas engines and tractors at Port Washington, Wis., has received orders from its Canadian distributers for more than $60,000 worth of tractors for immediate shipment. The removal of the import duty on tractors by the Canadian Government has stimulated business to an unusual extent.

MARVIN TRUCK TO BUILD

KENOSHA, WIS., March 29—The Marvin Truck Co., Kenosha, Wis., will add 45,000 sq. ft. to its works, which will enable it to double its output. In 1919 the production numbered 381 trucks, while the 1920 schedule calls for a minimum of 750. The new shop will be used for assembling, inspection, testing and shipping, releasing a large amount of space in the present plant for machine shop use.

MOLINE UNIT UNDER WAY

MOLINE, ILL., March 29—Plant No. 3 of the Moline Iron Works, erected on the old Moline Three-I league ball grounds, has started production. Employment will be given to from 200 to 250 men.

Will Investigate Farm Equipment

Economic Factors of Farm Power to Be Studied by Government

WASHINGTON, March 29—Investigation of farm tractors to determine testing and rating, of horses to secure working rating, of farm machines and implements to measure the power requirements, and of farm operations generally to secure accurate data relative to farm power, will be undertaken by the United States Department of Agriculture jointly with state colleges, agricultural and trade organizations in the near future.

Congress has been asked for funds to carry on the investigations, and as soon as they are made available work will be begun. This work is the result of suggestions made at a general conference on farm power problems participated in last fall at Chicago by representatives of the United States Department of Agriculture, state colleges and other associations.

The economic factors of farm power problems have been divided into farm power requirements to include field operations and hauling, animal power, mechanical power, relation of forms of farm power to man labor and influence on the farm organization and operation. Field operations include plowing, disking, seeding and harvesting.

Belt, drawbar and fuel economy tests of farm tractors, education in the care and use of farm equipment, service to owners of machines, causes of successes and failures in farm machines, adaptability and the power requirements of all types of farm machines and implements will be studied.

Will Apply All Tests

The testing and rating of farm tractors will include field and laboratory tests to determine belt brake horsepower and drawbar horsepower, as well as the fuel consumption of the tractor. These tests will be made under varied load conditions, probably at half and full load as rated by the manufacturer and also at maximum load that can be developed. The tractors will be operated at the speeds recommended by the manufacturers. There will be an endurance test for the purpose of showing any defects that may exist and to determine whether the rated load can be secured under conditions of continuous operation. It is proposed to issue a card showing the ratings of tractors. The committee decided that each of the forms of farm power now found on the modern farm in this country has its place, and that the central problem is to ascertain the respective fields in which each form of power can be used and the relative profit of the different forms in the fields in which they compete. It also declared that it is necessary to provide official ratings for tractors and that these should be Federal rather than State ratings.

Government Tests New Heating Furnace

Will Determine Feasibility of Producing Heat-Treated Steel Seamless Tubing

WASHINGTON, March 26—The Material Section, Engineering Division, is supervising a test of the Government furnace at Shelby, Ohio. This furnace was installed during the war for the purpose of heat-treating steel tubing in quantities for airplane construction, but was not completed until very recently. It is now undergoing a series of tests to determine the feasibility of producing heat-treated steel seamless tubing of very high tensile strength and elastic limit, to particularly meet Air Service Specification No. 10,229, for axle tubing.

The furnace, located at the plant of the Ohio Seamless Tube Co., is 7 ft. in diameter and 22 ft. deep, electrically heated and automatically controlled so as to give constant temperature within very narrow limits. The tubing is lowered into the furnace, which is sunken so that the top of the furnace is level with the floor, in a steel container (capacity 1152 ft. of 2 in. tubing) by means of a crane. On reaching the required heat the container with its cargo is hoisted out of the furnace, transported over the quenching tank where the bottom of the container is opened and the steel tubing, at the quenching temperature, is allowed to drop into the oil quenching bath.

The tempering operation is conducted in a similar manner, except that the maximum temperature of the tubing in the furnace is, of course, lower than it was for the quenching operation. These temperatures run approximately 1400 to 1600 deg. Fahr., for the quenching operation, and 400 deg. to 1000 deg. for the tempering operation, depending on the quality of steel used and the physical characteristics desired.

The furnace will be used principally for the heat-treating of alloy steel tubing with special reference to the tubing used in axles. Up to the present time no axle tubing has been produced in quantities which will meet the requirements of Specification No. 10,229, calling for 200,000 lb. tensible strength with five per cent elongation in 2 in.

NASH PLANTS NEAR READY

KENOSHA, WIS., March 29 — The Nash Motors Co. is completing a series of important factory extensions at its main works in Kenosha, Wis., where the Nash six and the Quad and other motor trucks are manufactured. Work on the new four-cylinder car division at Milwaukee also is nearing completion. At Kenosha there has been erected a foundry addition, 120 x 120 ft.; pattern storage and auxiliary, 80 x 100 ft.; roller bearing tool room and pattern shop, 100 x 600; addition to the sheet metal shop, 32 x 236 ft., and the courts between various shops have been roofed to form bays, measuring 42 x 236 ft., 60 x 257 ft., 90 x 257 ft. and 16 x 180 ft. A new boiler room, 50 x 50 ft., and an addition to the heat-treating building, 40 x 140 ft., are nearing completion. Work has been started on a brick and steel body shop, 40 x 1450 ft., three to five stories high. The aggregate floor space of the plant at Kenosha is now nearly 1,275,000 sq. ft. The payroll numbers in excess of 5,000 operatives, with more than 1,500 productive machines and 300 factory maintenance tools.

Milwaukee Wants Automobile Makers

MILWAUKEE, March 29—To sustain and accentuate in every way possible a big industrial development campaign directed largely at the automotive parts and general metalworking industries, the Milwaukee Association of Commerce has made important changes following the election of a new administration composed of the younger business men of the city.

One of the first steps of moment is the acquisition of Phil A. Grau of Chicago at a salary of $15,000 a year as business manager, a position formerly known as general secretary and paying $6,000 a year. The new census of 1920 shows the population of the city of Milwaukee to be 457,147 and that of the metropolitan district as 541,000, a gain of 22.3 and 36 per cent respectively.

TIRE PRODUCTION IN MAY

CLEVELAND, March 29—The Denman-Myers Cord Tire Co., a new $2,500,000 corporation, announces that it expects to be in production soon, possibly as early as May 1. Its plant is located at Warren, Ohio, while the general offices are in this city.

M. A. M. A. Works Out Advertising Plans

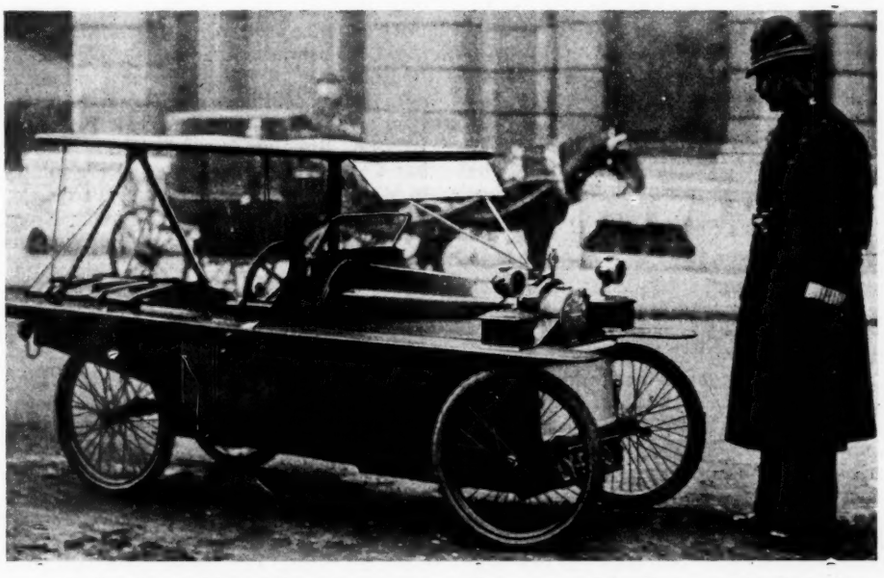
Committee of New Division Named to Plan Activities of Counsel

NEW YORK, March 29—Advertising problems of the automotive industry exclusively will be considered by an organization of advertising managers which will work within the Motor and Accessory Manufacturers' Association. Sixty advertising managers, representing some of the largest companies in the industry, attended a meeting at which a committee was appointed to work out the details and scope of the new association. All of them pledged their hearty support.

The committee is headed by E. C. Tibbitts of the B. F. Goodrich company, who will be assisted by J. J. Buzzell of the motor bearing division of the Hyatt Roller Bearing Co. of Detroit, and M. L. Hemingway, general manager of the M.A.M.A. These three were authorized to add new members to the executive committee as the need arises.

The main purpose of the organization will be to discuss strictly advertising problems as they relate to the automotive industry. It was explained that the national associations cover such a diversity of subjects that those of the automotive field are not covered sufficiently. J. C. McQuiston, president of the National Advertisers' Association, cordially endorsed the idea of having advertising managers specialize in their fields. Another speaker at the preliminary meeting was Richard H. Lee, special counsel of the vigilance committee of the Associated Advertising Clubs of the World.

A British Fly-Weight Motor Car



A London bobby giving the "once over" to a novel cycle car parked at the curb in Piccadilly. The machine is fitted with a hood and there is a place to carry luggage at the back. These cars would be useful to business men in event of future strikes

Australian Firm Opens Office Here

May Brothers, Largest in the Antipodes, Locate Buying Office in Detroit

DETROIT, March 29—Convinced that the American automobile not only will retain its hold but will increase its prestige in his country, H. May, of the firm of May Brothers, Proprietary Co., Ltd., of Sidney, Australia, has arrived in Detroit to open an office for the purchase of equipment for distribution in that territory. In addition to handling automobiles, May Brothers are the largest distributers of automobile, motor boat and marine accessories in West Australia, New South Wales and Queensland.

May Brothers have just completed a new factory, where they are building forty bodies each week to be used on American chassis. Under Australian laws one body is allowed to enter the country for every three chassis. This is due to labor in legislation in protection of Australian industry and necessitates the building of a majority of the bodies in that country.

"The American car has secured a firm hold in Australia," said May "there is no chance for British or any other product to overcome the lead secured by the American manufacturers. In fact, in Australia we like the 'pep' and enthusiasm of the Americans. An illustration of this is furnished by my recent visit to London. I visited a factory to secure equipment, and after stating my business, what I wanted, and going over in detail with the manufacturer as to what our requirements would be annually, he told me to incorporate that in a letter and post it to his firm, when the order would be taken care of.

"Hours mean dollars to us, and I promptly told him that if those were the methods to be pursued by British industries there was little chance of their making much headway in our country. I told him that in the time being consumed while the letter was being sent to him and deliberated upon in his office, an American manufacturer would have the shipment half way to Australia. That ended my efforts in England.

American Cars Sold Ahead

"All the American cars for which we secure shipping space are being sold rapidly, and every dealer in Australia has hundreds of orders booked ahead. Not only are we building bodies for distributers in our own territory, but also for New Zealand. It might be interesting for you to know that we built the body for the Dodge car, which created so much favorable comment at the New York show.

"May Brothers' representatives cover all of Australia visiting every garage of any consequence, and furnish the majority of the equipment used there."

May expects to be in Detroit for the next eighteen months arranging connections for future distribution of equipment. The firm expects to spend between a fourth and a half million dollars annually with American manufacturers for equipment alone. Meanwhile, body building efforts will be extended in the endeavor to keep up with the importation of American chassis. May said there is plenty of money in Australia, and despite the 50 per cent duty, the highest in the world, buyers are eager for American cars, and never haggle over the price.

The vast farming districts of Australia, May says, furnish a vantage ground for tractor manufacturers, and he predicts the business in tractors will be even greater than in passenger and commercial cars within a short time. A committee now is in this country investigating the work of tractors and their adaptability to Australia, and reports thus far, according to May, are to the effect that the tractors in use in American agriculture are highly adaptable to Australia.

Brooklyn Parts Men to Exhibit Products

NEW YORK, March 27—Brooklyn is to have a home town Industrial Exhibition in the Twenty-third Regiment Armory, April 10 to 17, inclusive. While the list of exhibitors shows no factory that turns out a complete automotive vehicle, there will be thirty exhibitors whose plants are well known to the industry.

H. H. Doehler, of the Doehler Die Casting Co., has been selected to open the exhibition, and his two associates in that ceremony are Frank H. Moses, of the Adriance Machine Works, and J. O. Skinner, of the E. W. Bliss Co.

Other exhibitors of interest to the automotive industry are: T. R. Brawley, Duplex Engine Governor Co, Eastern Tube & Tool Co., Eisemann Magneto Co., Estey Brothers, Fairbanks, Morse Co., Fulton Foundry & Machine Co., Generator Valve Co., Greenpoint Belting Co., Hay-Hudden Mfg. Co., Hilo Varnish Corp., Irving Iron Works, Laurence Belting Co., Murcott & Campbell, New York Leather Belting Co., Thomas Paulson & Son, Inc., the Peelle Co., Penn Brass & Bronze Works, John Polachek Bronze & Iron Co., Reliance Metal Spinning Stamping Co., Inc., J. W. Richardson Foundry & Metal Corp., The V. & O. Press Co., Valentine & Co., William Vogel & Bros., Inc., Wahlstrom Tool Co., J. H. Williams & Co.

JOIN ILLINOIS ASSOCIATION

SPRINGFIELD, ILL., March 27—Every branch of the automotive and allied industries is represented in the Illinois Automotive Dealers' Association which was organized here this week. Several car manufacturers are included in the membership which embraces dealers in passenger cars, trucks, tractors, tires and all kinds of equipment. The manufacturers said they believed they could get valuable ideas for their production and service departments by a close affiliation with the men who sell the goods they make.

Highway Motors Co. Absorbs Two Plants

New Ohio Corporation to Make Engines—Takes Over Detroit Concerns

DETROIT, March 30—Highway Motors Corp. of Defiance, Ohio, capitalized at $1,500,000, has taken over Golden, Belknap & Swartz, manufacturers of engines, and the Fruchey Machine Co., makers of automobile parts. The new corporation has divided its stock equally between common and preferred, all the common having been paid in.

Highway Motors has taken over a factory at Defiance, to which additions will be built. The plant will be equipped for the manufacture of high grade engines for passenger cars and trucks. Special machines for making a new model G. B. & S. will be installed at a cost of $250,000. The Ohio factory will be ready for operation Oct. 1. The Detroit plants will remain at work in the meantime.

A daily production of 150 of the new model engines is proposed. A testing department will be built apart from the new factory.

Golden, Belknap & Swartz, with a capacity of 60 engines a day, have been supplying Bell Motor Car Co., York, Pa.; Pioneer Truck Co., Chicago; Laverne Automobile Co., Laverne, Minn., and Defiance Truck Co. The Fruchey Co. manufactures crank cases for King Motor Car Co. and has contracts for parts with many of the larger automobile manufacturers.

The new company is headed by C. H. Kettenring of Kettenring Machine Co., Defiance. R. P. Kettenring is first vice-president; E. H. Belknap, Detroit, second vice-president and chief engineer; J. W. Swartz, third vice-president and purchasing agent; A. M. Pierson, Detroit, fourth vice-president, and J. W. Wright, secretary and treasurer.

TO STUDY LABOR SITUATION

WASHINGTON, March 29—Because of the scarcity of rough labor in the United States, the House Immigration Committee will investigate general conditions throughout the country with a view to recommending necessary legislation.

ENGLISH WALLIS UNDER WAY

RACINE, WIS., March 27—The Wallis tractor is being manufactured in England for the British Wallis Tractors, Ltd., and the first run of production will be made by Rushton-Hornsby, Ltd., Lincoln, England.

SHOTWELL-JOHNSON BUYS SITE

MINNEAPOLIS, March 27—A ten-acre tract upon which to build a larger plant for the manufacture of sheet metal parts and radiators has been purchased by Shotwell-Johnson Co. It will be located in northeast Minneapolis.

British Engineers Elect New Council

Only 38 Per Cent of Membership Votes at Elections—Gains 47 Members

LONDON, March 12 (*Special Correspondence*)—The new council of the Institution of Automobile Engineers consists of Sir Herbert Austin, Captain J. S. Critchley, W. J. Iden, F. W. Lanchester, Lt. Col. M. O'Gorman, Major B. W. Shilson, F. G. Wollard, Lt. Col. T. B. Browne, Sir Robert Hadfield and Douglas Leechman, F. L. Martineau, H. R. Ricardo, and E. B. Wood. The ballot for these elections attracted only 38 per cent of the membership, leaving it to be inferred that 62 per cent were not interested in this usually accounted important proceeding.

The annual report shows that the membership of all grades numbered 1200 at the end of 1918, and 1247 at the like period of 1919. Fourteen members in all grades died, six resigned, 39 were transferred to higher grades, and 117 names were removed. The net gain in membership, therefore, was 47, made up of one honorary member, 14 members, 56 associate members and 10 associates.

There has been a decrease of 34 in the graduates section, which numbered 238 at the end of 1918, and had fallen to 204 at the end of 1919. This shrinkage is not an encouraging sign, having regard to the lessons of the war, and in view of the new British Education Act which imposes continued attendance up to 18 years of age at technical and other schools after the normal leaving age for scholars for elementary schools.

The Institution, it has been felt for some time, has needed "bucking up"; the monthly papers being until recently more academic than practical; in fact, blame on this score might be leveled against some other British scientific and technical bodies. ENGLISHMAN

KILL BUS TAX ORDINANCE

ST. LOUIS, March 27—The Board of Aldermen has killed a city ordinance, providing for the regulation of motor-bus traffic and levying an annual license fee of $25 for each bus in addition to an operating tax of 3 per cent of the gross revenue. The chairman of the legislative committee stated that the Missouri Motor Bus Co., now operating a line, had consented to paying the tax. The ordinance was defeated on the ground that it would be unfair to the companies to pay a tax until the business is firmly established.

DRAKE PLANS FOREIGN TRADE

SAN FRANCISCO, March 29—Demand for their product from foreign countries is reported by the Drake Lock-Nut Co. By investigating ocean freight rates and getting an average, it was learned by George F. Drake, general manager, an average slightly lower discount from the list price of Drake lock nuts would pay the ocean freight rates to any usual seaport in the world, and in a few cases a combination of rail to Galveston, New Orleans, New York or other seaport.

In some cases the freight rate will amount to slightly more than the amount gained by the lower discount from the list price and in others it will be slightly less, so that an average is obtained thus enabling the Drake Lock-Nut Co. to quote their product c.i.f. to any seaport in the world.

American Develops New Farm Light Unit

CHARLES CITY, IOWA, March 29—The farm lighting outfit of the American Tractor & Foundry Co., Charles City, which will be sold under the trade name Americo, if the same can be copyrighted, is of 1500 watt capacity and comprises a single cylinder 3½ x 3¾ in. engine operating at 1200 r.p.m., which is connected by means of a flexible coupling to the electric generator. Deliveries are to begin in April and it is planned to turn out 5000 of these plants the first year.

The crankshaft is carried on ball and roller bearings. A spiral gear drive is used for the camshaft, which carries the timer at one end and is arranged to take a governor at the other, if desired. A Westinghouse generator is used. It has a normal capacity of 50 amperes at 36 volts. The switchboard is mounted directly on the generator frame, and this equipment is assembled as one unit, with short connections between the generator and the switchboard. The governor, which is furnished only as an extra, acts on the throttle valve and is claimed to control the speed within a limit of 2½ per cent.

The engine is designed with the idea of having enough power to operate washing machines, etc., while running the generator at its full capacity, and to this end is provided with a 2½ x 4 in. pulley, which is secured directly to the flywheel.

The switchboard is mounted on the generator by brackets, which support the switchboard and fuel tank. It is 8 in. wide by 12 in. high. On it are mounted a voltmeter, an ammeter, a service switch, service fuses, a starting switch and an automatic cut-out.

TO ORGANIZE CHAMBER

WASHINGTON, March 27—The new International Chamber of Commerce, projected at the International Trade Conference at Atlantic City last October, will be formally organized, it is announced by the Chamber of Commerce of the United States, at Paris, during the week of June 21, 1920. Invitations have been sent out by the American group of the International Organization Committee to business and industrial associations, asking them to name delegates to participate in the organization meeting. About 100 American delegates are expected to attend.

Corner in Stutz; Trading Suspended

Stock Exchange Governors Take Drastic Action After Sensational Rise

NEW YORK, April 1—Trading in the stock of the Stutz Motor Car Co. on the New York Stock Exchange was suspended indefinitely by the Board of Governors at the close of business Wednesday. The action was taken after it had been determined the recent amazing advances in Stutz stock were the result of a corner. The shares sold yesterday at 391.

No intimation has been given as to what plans are under consideration for fulfilling contracts entered into between buyers and sellers. Allan A. Ryan & Co. control, in certified form, about 80 per cent. of the Stutz shares and have contracts for the delivery of Stutz stock making up more than the remaining 20 per cent of the 100,000 shares. Ryan & Co. printed an advertisement this morning announcing they would buy Stutz stock.

Although Stutz has not actually been banished from the exchange, it is believed it will be forced onto the outside market.

There had been reports that the Business Conduct Committee of the New York Stock Exchange was not overlooking the possibility of a corner in Stutz. The policy of the exchange has been not to permit corners, and an incipient one in General Motors was broken recently.

Stockholders of Stutz Motors at a meeting Friday authorized an increase in capital stock from 100,000 shares of no par value to 120,000 shares of no par value. The additional 20 000 shares will be used to pay a stock dividend of one-fifth of a share, recently declared payable April 15. Shorts in Stutz will have to pay this dividend, which, based upon the present value of shares, will amount to approximately $60 a share. There are unconfirmed reports that the company intends to pay 100 per cent in stock dividends during the year.

The General Motors Co. started the dividends of the present year on a 20 per cent per annum basis, divided equally between cash and stock, so that the value of the whole is about $50 per share, or more than 25 per cent larger than the past year's earnings. General Motors is expanding very rapidly. Production is now about 1800 motors a day, and it is predicted that before the end of the year the company will be doing a business exceeding $1,000,000,000 per annum. The earnings are relatively small, however, compared with the magnitude of the business.

Reports that General Motors contemplated absorption of Pierce-Arrow and Stutz are emphatically denied and apparently are without foundation. Pierce-Arrow stock has been very active on the stock exchange recently, as has that of White and Maxwell. All three have made substantial gains of late.

Scotch Want Cars, Turn to America

British Unable to Meet Demands and Tariffs Hurt Other Countries

WASHINGTON, March 26—A probable market for automobiles exists in Edinburgh and throughout Scotland as a result of the lessons brought home to the Scotch people during the war, when horses had to be turned over to the military forces and mechanical traction methods were introduced, according to a report received from Consul R. Fleming by the Bureau of Foreign and Domestic Commerce. The result is an enormous demand for motor vehicles, greater than the supply.

Prior to the war Germany shipped many cars into this market, but although, states Consul Fleming, the bitterness against Germany has abated somewhat, there is no desire to handle German goods. Belgian cars have a fair reputation but are not being produced in sufficient quantities. Italy and France are prohibited from engaging in business in Scotland by a tariff of 33½ per cent.

British manufacturers can not cope with the demand, and consequently it is to the American manufacturer that the dealers are looking. At this time purchasers are clamoring for cars and paying exorbitant prices for those delivered promptly. Five-year old motor cars have sold for 50 per cent in excess of their original cost.

One important dealer reports a steady and urgent call for passenger cars ranging from $3,406 to $4,866, and for business vehicles ranging from $2,920 to $5,840. He has had brisk inquiries for motor omnibuses and touring cars. The Corporation of Edinburgh has experimented with a type of 4-ton touring car carrying thirty-two passengers and costing $7,780.

Bus Lines Prove Popular

These have been used for opening up to sightseers parts of the city and its environments imperfectly served by the corporation tramways. They proved successful beyond expectation and a dozen additional cars were ordered. It is a common belief that next summer there will be a great demand for such conveyances all over the country. Vehicles of 3-ton or 4-ton capacity, to seat thirty persons and to cost $7,300 to $7,786, are wanted to link up small outlying villages with neighboring cities or towns.

The one company which produces heavy motor vehicles in Edinburgh for its own use has a fleet of fifty motor buses running daily between Edinburgh and surrounding country towns and villages. On certain routes the company's operations have seriously affected the railways. The omnibus traffic was remarkably profitable during the summer of 1919.

Edinburgh is a particularly good place for motor car distribution, owing to its position relative to such large and important towns as Dundee and Aberdeen, and to the English border sections.

While anxious enough, naturally, that British manufacturers and workmen should benefit by the demand for motor vehicles, dealers are not disposed to argue the point; they are not particular where the cars come from if the right goods come to the market promptly. One large firm freely says that the public are recognizing that American-made cars are more fully equipped than British cars, and contain many little luxurious touches which British makers have apparently not yet thought of.

Inferiority Notions Dissipated

The old notion that the American car is less solidly built than the British has been dissipated. Quality for quality, American cars can be marketed in Scotland for lower prices than those obtaining for British makes. Spare parts of American makes can also be obtained with ease and at prices more consistent with the manufacturing costs.

On October 1, 1919, there were in the Edinburgh consular district 5556 private automobiles, 2864 cars used for trade purposes, 1219 taxis and private cars used for hire, 1132 heavy motor cars (of more than 2-ton weight), and 8145 motorcycles.

St. Louis Association to Lease Warehouse

ST. LOUIS, March 26—A separate corporation is being organized by members of the St. Louis Automobile Manufacturers' and Dealers' Association to lease a large warehouse in East St. Louis for the storing of cars. The purpose is to combat what they term the high cost of storage in St. Louis, the charges being from $7 to $9 per month per car. No suitable building on this side of the Mississippi is available. The East St. Louis warehouse is available to the railroad tracks, and most of the cars shipped to St. Louis are from the East. The plan is to base the storage charges on the actual cost of rent and operation.

The matter was discussed at last Thursday evening's meeting of the association. Here also it was decided to take a poll of the members to ascertain the number of used cars, and their makes, in the hands of dealers. The object of the census was to learn whether the number of used cars on hand was normal.

Resolutions were adopted urging railroads to have wide-door cars adapted to carrying motor cars built in their new equipment.

MAINE PLANS HIGHWAYS

AUGUSTA, ME., March 26—The State Treasurer has sold to a New York syndicate $2,500,000 of highway and $500,000 of bridge bonds.

CAPITAL STOCK INCREASED

MILWAUKEE, March 26—The Economy Carbureter Co., Milwaukee, has increased its capital stock from $50,000 to $75,000 and will increase its output.

Says Workers Will Control Industry

British Motor Trade to Pass from Capitalists, Says Union Secretary

LONDON, March 11 (*Special Correspondence*)—Tom Mann, a well known and respected labor leader and recently appointed secretary of the Amalgamated Society of Engineers, told a big meeting in London that capitalistic control of industry is doomed, and urged the workers to adopt a practical rather than a speculative policy.

He enunciated as a principle that an industry must be responsible for maintaining all connected with it, and subsequently the meeting interpreted this ideal in the terms of a resolution affirming "the advisability of establishing machinery which would be instrumental in facilitating the creation of a national movement with the object of taking over and controlling the whole of the engineering industry by the cooperative engineers themselves."

After a discussion on the wages and the 1917 agreement, a resolution was carried "refusing to recognize the 1917 agreement because it was signed without the consent of the members and, in any case, that it was a war-time measure and was therefore not now operative, and instructing the London district to press for a basic rate of 72 cents (pre-war rate) per hour, and to take such steps as may be necessary to bring this about."

It is noteworthy that this rate per hour is a trifle less than the Ford company is paying without reference to whether the worker is skilled or unskilled, or a member of a trade union. It should be noted also that the A. S. E., the trade union concerned, is the largest and wealthiest of British trade bodies, and has adopted a working agreement with other bodies which is likely to weld the whole of the mechanical trade unions into a solid federation for cooperative effort. It has funds exceeding $5,000,000.

ENGLISHMAN.

TO MAKE PATENT WARMER

APPLETON, WIS., March 26—The Appleton Wonder Dry Heat Co. has been organized at Appleton, Wis., with a capitalization of $150,000 and will engage in the manufacture of foot warmers, food containers and other articles for tourists and motorists. It has exclusive patents on what is known as a "waterless hot water bottle," consisting of a copper or aluminum receptacle.

By the use of a chemical formula, intense heat is generated within the vacuum between casings when the receptacle is violently shaken for 30 seconds. The heat is retained for five to seven hours and is created without the use of fire, gas or electricity. A factory will be erected at once. The device will retail at about $5. Alfred A. Archibald of Appleton, the inventor and patentee, will be general manager.

Fisher Body Building Contracts Awarded

Plant at Cleveland to Provide 880,000 Feet Floor Space —Cost $5,000,000

NEW YORK, March 31—More than 880,000 sq. ft. of floor space will be provided in the new plant of the Fisher Body Ohio Co., at Cleveland, the construction contracts for which have just been let, at a cost of approximately $5,000,000, to the Thompson-Starrett Co. of this city. Completion of the projected buildings, on which work will start at once, has been scheduled for Nov. 1, although certain units are to be turned over for the erection of the machinery not later than June 15.

The buildings to be erected are:

Body plant, 74 x 1150 ft., six stories.

Mill building, 500 x 300 ft., two stories.

Crane runway, 40 x 300 ft.

Press building, 120 x 430 ft., 40 ft. in height.

Stock building, 72 x 500 ft., two stories.

Trainshed, 60 x 460 ft.

Details of the construction, which were made public to-day, were that the body plant and the stock building were to be of flat slab reinforced concrete, with the latter structure capable of being extended to six stories. The crane runway and mill building are to have flat slab floors with structural steel frames. Work by the Thompson-Starrett Co. on the mill, kiln and crane buildings is to be completed by June 15, so that the setting of machinery may precede the completion of the body plant, thus permitting, it was planned, the production of material for immediate use in the body structure.

All of the concrete work is to be completed by Oct. 1. As rapidly, however, as each floor is finished, the work of fitting machinery and equipment should be commenced so that production will be started as early as possible.

Rubber Corporation to Combine Three Plants

TRENTON, N. J., March 30—The Rubber Corporation of America has been organized with a capital of $2,000,000 to take over the Empire and Sterling plants and another in the Middle West. W. M. Pepper is chairman of the board and F. I. Reynolds is president. Vice-presidents in charge of sales are: J. Baker Taylor, eastern section of the United States, Ralph V. Dickinson, central section, and A. W. Fargo, western section.

The company will maintain warehousing facilities at Boston, New York, Philadelphia, Atlanta, Cleveland, Chicago, Kansas City, San Francisco, and, perhaps, at one or two other points.

GASOLINE EXPORTS GROW

WASHINGTON, March 29—Mineral oil exports for February, 1920, show a decided increase as compared with February, 1919. Exports in February of this year amounted to 226,729,124 gal., valued at $34,185,340, as against 165,838,895 gal. worth $25,513,093 exported in February, 1919. Gasoline exports in February of this year totaled 32,300,057 gal. valued at $7,917,706, as against 26,964,764 gal. valued at $6,373,852, shipped in February, 1919.

General Electric Co. Repudiates Circular

NEW YORK, March 31.—The General Electric Co. has sent a notice to its stockholders repudiating all connection with the Steinmetz Electric Motor Car Corp., headed by Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric. The circular says:

"The attention of the officers of the General Electric Co. is being constantly called to the wide distribution among the company's stockholders of a letter from the Steinmetz Syndicate, Mr. J. P. Story, Jr., Chairman, 512 Fifth Avenue, New York, the first paragraph of which reads as follows: 'As a stockholder of the General Electric Co. you will be interested to know that the Steinmetz Electric Motor Car Corp. has been organized, with Dr. Charles P. Steinmetz as chief consulting engineer, for the manufacture,' etc.

"Without expressing any opinion as to the merits of the Steinmetz Syndicate, the General Electric Co. feels it its duty to say that such circular was issued without the knowledge, approval or consent of the General Electric Co. or its officers, and neither the General Electric Co. nor any of its officers is interested in any way, financially or otherwise, in the Steinmetz Syndicate or Steinmetz Electric Motor Car Corp."

Advance-Rumely Shows Big Increase in Trade

NEW YORK, March 30—A marked increase in earnings was shown in the annual report for 1919 of the Advance-Rumely Company, made public to-day. Total profits and income from all sources amounted to $5,382,149, as compared with $3,393,703 for 1918. After expenses, Federal taxes and charges there was a balance available for dividends of $2,401,907. This would be equivalent, after allowance for preferred, to $12.02 a share on the common, as compared with $3.19 a share on the common the preceding year.

President Finley P. Mount said:

"Whatever may be the course and outcome of the period of reconstruction, the fact remains that agriculture is and must remain the greatest basic industry of the world. The need for labor-saving machinery on the farm has never been so great as it is now. The tractor particularly has shown its value, not only in the saving of labor on the farm but also in the increased yields produced by the more intensive cultivation made possible by this unit of power farming machinery. The constant increase of power units on the farm creates a greater demand for power-driven machinery."

Farm Truck Buying Shows Rapid Growth

Eastern States Agriculturists Buy Many Vehicles in Past Three Years

WASHINGTON, March 29—Farmers in the Eastern section of the United States have been adding motor trucks to their farm equipment rapidly during the past three years, according to figures obtained by the United States Department of Agriculture, which is investigating the use of motor trucks by farmers.

Reports from approximately 1000 farmer truck owners in the New England Sates, New York, Pennsylvania, New Jersey, Delaware and Maryland during January and February, show that at that time over 80 per cent had owned their machines less than three years. The length of time 955 of these men had owned their machines is as follows: Less than one year, 373; more than one year but less than two, 237; more than two years but less than three, 181; more than three years but less than four, 86; more than four years but less than five, 37; more than five years, 41.

These reports were all from farmers who had purchased new trucks for their individual use. Reports on second-hand machines and on truck attachments for pleasure cars, as well as trucks used primarily for custom work or on regularly established routes, were not included in the count. While it is impossible to determine just how many of the trucks which have been in use only one or two years were purchased to replace other trucks, worn out or discarded, it is known that a large percentage of the reports covers first experience with trucks.

MILWAUKEE COMPLETES LINE

MILWAUKEE, March 26—The Clarotta Mfg. Co., a new $1,000,000 corporation organized in Milwaukee by O. G. Pfeifer, W. A. Kuebler and Thomas C. Hanson, is engaging in the manufacture of automotive parts and will specialize in clutches for passenger cars and motor trucks. An existing plant has been purchased and equipped, and a force of 125 is now at work on a production of 200 per day.

A single order accepted by the company during the past week calls for the delivery of 100 clutches a day. With the addition of the new clutch plant, Milwaukee has achieved the distinction of manufacturing every part entering into the construction of passenger and commercial cars, being already the largest producer of automotive parts in the world.

RUBBER PLANT UNDER WAY

HARTFORD, CONN., March 26—Foundations have been laid for three of the four new buildings in the Hartford rubber works group of the United States Rubber Co.

Automotive Financial Notes

Hayes Wheel Co.—Annual report for 1919 shows net sales of $14,686,383, as compared with $7,655,249 for 1918. Its net profits last year were $1,501,565, compared with $531,440 for 1918, leaving a surplus on Dec. 31 last of $765,565.

Autocar Co.—Directors declared stock dividend of 40 per cent on $3,000,000 outstanding capital.

Reliance Wheel Co.—Capital increased to $200,000 of 8 per cent preferred and 25,000 shares no par value common to finance erection of plant on 30-acre site.

Universal Mfg. Co., Des Moines, Iowa.—Incorporated for $250,000 with H. K. Holden, president, and R. H. Clifton, designing engineer, to manufacture timers for Fords, radiator shutters, transmission locks and luggage carriers.

British-Canadian Machine & Tool Co., Ltd., has taken over Reliance Motor & Tool Co. and International Machine & Tool Co.

Continental Motors Corp. has sold $5,000,000 7 per cent notes to Chicago bankers and will double its producing capacity.

Willys-Overland Co. announces export orders on books are more than three times as total foreign shipments for any preceding year.

Marsh Motor Car Co.—Capital increased to $3,250,000 and has new factory under way.

Herschell-Spillman Motor Co. declared extra dividend of ½ per cent in addition to regular quarterly of 2 per cent on common stock.

Marion Tire & Rubber Co., Marion, Ohio.—Reorganized with Allen F. Ayers, Akron banker, as president. Capital increased from $300,000 to $750,000.

Hupp Motor Co. declared 2½ per cent quarterly dividend on common stock.

Chicago Motor Bus Co.—Involuntary petition in bankruptcy filed by creditors as result of action started by New York bonding company.

Willys-Overland Co.—Stockholders authorize $25,000,000 increase in common stock, making authorized capital $75,000,000 common and $25,000,000 preferred.

Highway Motors Co., Defiance, Ohio.—Incorporated with $1,500,000 capital, virtually all paid in, to manufacture passenger cars. Incorporators: C. H. Kettering, A. M. Pearson, T. T. Shaw, R. P. Kettering, H. S. Reynolds, J. W. Wright, E. H. Belknap and J. W. Swartz.

Champion Motor Car Co., Cleveland.—Chartered with $525,000 capital to manufacture and sell motor cars.

Paramount Motor Parts Co., Cincinnati.—Incorporated with $50,000 capital to manufacture parts and appliances for motor cars.

Cleveland Cam Shaft Co., Cleveland.—Chartered with $100,000 capital to manufacture cam shafts and other motor parts.

Whitney Tractor Co., Cleveland.—Incorporated with $1,000,000 capital to manufacture several models of tractors. Incorporators: E. E. McCloud, S. R. Fitzsimmons, M. A. Grady, A. F Gondor and H C. Berhous.

Rainier Motor Corp. adds George R. Baker of Chatham & Phenix National Bank, John Nickerson, Jr., and William J. F. Piel to board of directors.

Standard Parts Co.—New board of directors expressed opinion at first meeting that preferred dividend payable April 1 should be deferred until company's permanent financing has been completed and then promptly resumed.

Walker Johnson Truck Co. files certificate with Massachusetts Commission of Corporations increasing capital from $500,000 to $3,500,000.

Lansing Stamping & Tool Co. increased capitalization from $100,000 to $300,000.

McCord Manufacturing Co. declared usual 1¾ per cent on preferred stock and of $1 a share on common. Common dividend represents an increase of 25 cents over preceding quarter.

Ann Arbor Machine Corp. increased capital from $150,000 to $500,000. The company recently formed a connection with Fordson Tractor Co. for ensilage cutters, necessitating an expansion in production. E. P. Mills, former Lansing banker, is secretary.

Republic Motor Truck Co., Inc., declared regular quarterly dividend of $1.75 on the preferred stock.

Hood Rubber Co.—Sales in 1919 aggregated $22.969,664, an increase of approximately $600.000 over the preceding year. Surplus of $2,863,953 at the end of 1919 showed an increase of $200,000 over the year previous.

Standard Screw Co. will pay the regular quarterly dividend of 6 per cent on common stock April 1.

Dayton Rubber Manufacturing Co. declared quarterly dividend of $1.75 on preferred stock.

Dearborn Truck Co. declared quarterly dividend of 1¾ per cent on preferred.

C. M. Hall Lamp Co. declared quarterly dividend of 5 per cent.

B. F. Goodrich Co.—Net sales for 1920 expected to reach $200,000,000, an increase of about 40 per cent over 1919.

Hartford Auto Parts Co. — Regular quarterly dividend of 2 per cent on the preferred stock.

Republic Motor Truck Co. — Regular quarterly dividend of 1¾ per cent on preferred stock.

Cincinnati Rubber Co. — Capital increased from $250,000 to $1,000,000.

Cyclone Starter & Truck Co., Paris, S. C. — Incorporated with $1,000,000 capital.

Federal Motor Truck Co.—Will increase capital from $1,000,000 to $2,000,000, the increase to be distributed in the form of a 100 per cent stock dividend.

Paige-Detroit Motor Car Co.—Lists earnings before taxes in 1919 at $2,200,000.

Cadrain Auto Motors Corp., Boston.—Incorporated with $200,000 capital by Joseph M. Cadrain, George J. Cadrain and Albert L. Ayer.

Southern Automobile Mfg. Co., Memphis, Tenn.—Capitalized at $1,000,000 to make automobiles, trucks, tractors and tires. W. A. King is president and general manager. Proposes to spend $250,000 for plant and equipment.

United States Axle Co., Pottstown, Pa.—Organized to manufacture automobile axles.

Peerless Truck & Motor Co.—Declared quarterly dividend of $1.25 on stock ($50 par value) making rate 10 per cent annually instead of 8 per cent.

Minerva Engine Co., Cleveland.—Increased capital from $250,000 to $1,000,000 to provide manufacturing facilities.

BANK CREDITS

AUTOMOTIVE INDUSTRIES begins to-day the publication, under this heading, of a weekly statement on the credit situation, prepared exclusively for this publication by the Guaranty Trust Co. of New York, second largest banking institution in the United States.

It would be easy to exaggerate the importance, so far as domestic credit is concerned, of the shipments of gold from England. The last ten months have witnessed a net loss of gold by this country of roughly $350,000,000 in the midst of extraordinary demands for credits.

Whatever the imports of gold in the near future, it is very probable that the prevailing credit stringency will continue for some time. On many hands reports are heard of caution in buying as a reflection of a slackened public demand for articles of consumption; yet both domestic and foreign demand are still heavy, and prospects of profits continue great.

Furthermore, entirely apart from current needs, there are the huge investment requirements of the railroads, other public utilities, the motor and electrical industries, iron and steel, and a dozen other industries.

Of the conditions in the capital market, the lack of real resiliency in the bond market is an index, while the conditions in the current credit market are indicated by the low bank reserves and by high money rates.

CONTINENTAL ISSUES NOTES

DETROIT, March 26—In a letter to stockholders President R. W. Judson of Continental Motors Corp., explains that the issuing of $5,000,000 of five year 7 per cent notes will "amortize over a period of years the cost of new additions and machinery equipment, provide funds for larger inventories and enable the company to maintain substantial cash reserves" without using bank lines of credit.

Men of the Industry

Harry L. Bill, manager of manufacturing and production for the Winton Motor Car Co., has resigned to become vice-president and general manager of the Saxon Car Co. He was with the Chalmers Motor Co. before going with Winton, and is considered an authority on shop management and production.

F. G. Allen, former president of Moline Plow Co., is president of the newly organized Engineering Development Co., Moline, Ill. Associated with him are T. B. Funk, chief engineer of Moline tractor branch, and C. M. Eason, former manager of the tractor bearing division of Hyatt Roller Bearing Co. Eason is general manager of the new company.

W. B. Mertens has been elected chief engineer of Friend Motors Co.

D. C. Selheimer, formerly of Packard Motor Car Co., has become works manager of LaFayette Motors.

John Perkins, late superintendent of Packard truck division, has been appointed production manager of Lewis-Hall Motors Corp.

Ralph S. Allen, general salesmanager of Duratex Co., Newark, N. J., has been promoted to vice-president and member of board of directors.

J. R. Adair has been appointed manager of the Racine branch house of J. I. Case Plow Works Co.

Godfrey H. Atkin has been appointed Western district manager of Electric Storage Battery Co., in charge of all departments in Chicago, St. Louis, Kansas City, Minneapolis and Denver.

S. K. Miller has been elected vice-president of the Kentucky Wagon Mfg. Co. He has been general salesmanager since 1918.

S. W. Steinberg has become publicity director of Rainier Motor Corp., succeeding Putnam Drew.

C. G. Germaine, who has represented the Standard Welding plant of Standard Parts Co. in the Western territory, has resigned to become Western representative of Kelley Metals Co., with headquarters at Chicago.

A. L. Ellis, formerly with spring division of Detroit Steel Products Co., has been appointed production manager of Jenkins Vulcan Spring Co.

C. M. Wood, formerly sales engineer of H. W. Johns-Manville Co., has assumed charge of the recently established Good Roads Bureau of Goodyear Tire & Rubber Co. He has had wide experience in road engineering and highway construction.

C. L. Sonen has resigned as production manager of Teetor-Hartley Motor Corp., Hagerstown, Md., to organize the C. L. Sonen Co., industrial manufacturing engineers, located in Indianapolis.

Otto L. Lewis, who has been connected with Southern Motor Mfg. Assn., Houston, Tex., in the development of a motor cultivator, has retired to construct a line of power farming machinery suitable to Southern conditions.

Courtney Johnson, production manager of Dort Motor Car Co., has been made assistant to general manager D. M. Averill. H. F. Whitmore succeeds Johnson as production manager.

J. R. Van Cleve, former service manager of Dort Motor Car Co., has purchased an interest in the Commercial Motor Car Co. of Memphis, Dort dealers.

L. Clayton Hill, for eight years connected with Packard in chassis design work and as body and airplane engineer, has opened offices in Detroit as consulting engineer, specializing in the automotive field.

W. G. LeFevre, for several years special representative for the Kelly-Springfield Motor Truck Co., has resigned to become general salesmanager for Tower Motor Truck Co., Greenville, Mich.

E. J. Cahill has been made service manager of the Trask Kennedy Co., Detroit distributer of Stanley steam cars.

Don C. Prentiss, formerly assistant general salesmanager of Packard, now is general sales and advertising manager of the W. R. Johnston Manufacturing Co., Chicago.

L. M. Smith and C. J. Craven have been appointed production manager and manager of stock department, respectively, of Detroit Transportation Truck Co, Monroe, Mich. Both formerly were connected with the Standard Truck Co.

J. H. Dutch has been made special representative of the manufacturers' sale department of the Firestone Tire & Rubber Co., with headquarters at Detroit.

H. M. Wirth, who has been treasurer of the Liberty Motor Car Co. since its organization, has resigned to become associated with the Kelsey Wheel organization.

H. J. Butler has been appointed salesmanager for the Oneida Motor Truck Co., Green Bay, Wis., replacing C. J. Welch. He formerly was with Edison Storage Battery Co. as Chicago manager.

M. W. Reed, engineer in the truck division of the Paige Motor Co., will engage in retail sales for the Paige company on April 1.

C. W. Butterfield, for the past four years connected with the Dyneto Electric Corp. of Syracuse, has been appointed salesmanager of the Herschell-Spillman Motor Company, North Tonawanda, N. Y.

George O. Starr has resigned as salesmanager of the Murray Motor Car Co.

F. L. Waite, who resigned recently as advertising manager of Reo Motor Car Co., has joined the organization of the New-Way Motor Co. in the sales promotion department as advertising manager.

Paul E. Ryan has been appointed manager of the Perfection Spring Co. of the Standard Parts Co. of this city. Mr. Ryan formerly was production director for the Aluminum Castings Co.

William E. Hutchinson, formerly of the Edward Valve & Mfg. Co., East Chicago, Ind., and the Denby Motor Truck Co. of Detroit, has been appointed purchasing agent, of the Beneke & Kropf Mfg. Co. of Chicago, manufacturers of the Rayfield Carbureter.

BAUER SUCCEEDS COBLEIGH

NEW YORK, March 29—George F. Bauer, commercial agent in the New York office of the Bureau of Foreign and Domestic Commerce, has been engaged as secretary of the Foreign Trade Department of the National Automobile Chamber of Commerce. His specialties have been the tariff and foreign statistics.

Bauer succeeds H. R. Cobleigh, who has been appointed secretary of the new service department established by the N. A. C. C. to bring about an extension of standardization and better service conditions in automobile plants and in the stations of their distributors and dealers.

CHICAGO TOOL MOVES OFFICE

NEW YORK, March 29—General offices of the Chicago Pneumatic Tool Co. will be transferred to this city April 1. They will be located in the Chicago Pneumatic Building, a new ten-story structure at 6 East Forty-fourth Street. Carefully laid plans made it possible to move the organization without disrupting business.

DURATEX BREAKS GROUND

NEWARK, N. J., March 29—Duratex Co. has broken ground for new buildings which will provide 100,000 additional feet of floor space. Branch offices have been established in some of the principal distributing centers, including Detroit and Chicago, and representatives for foreign countries are being appointed.

E. & W. ADDS TRAILER LINE

MILWAUKEE, March 29—The E. & W. Mfg. Co., for several years manufacturing attachments for converting passenger car chassis into motor trucks, is now building trailers in various styles and sizes. It is the first trailer plant to be established in Milwaukee.

CASE LIMITS PRODUCTION

RACINE, WIS., March 27—Only a limited number of the four body models of Model V Case cars will be produced this year, it is announced by the J. I. Case Threshing Machine Co. The total will be approximately 3500, of which about one-third will be closed cars.

Calendar

SHOWS

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

FOREIGN SHOWS

April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.

May 15-June 13 — Cars, Parts and Accessories. Antwerp.

June 26-July 25 — Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15 — Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show, Olympia.

November—London. Passenger Car Show, Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31 — Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17 — Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30 — Atlantic City. Third American Aeronautic Congress, Aero Club of America.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

April 7—Minneapolis Section Meeting. Subject—Tractor Weight and Drawbar Pulls.

April 8—Metropolitan Section, Automobile Club of America, New York. Subject—A Study of Tire Deflection and Unsprung Weight in Trucks. Speaker, A. F. Masury. Illustrated.

June 21-25 — Ottawa Beach, Mich. Summer Conference.

Truck Sales Managers Plan Trade Expansion

CHICAGO, March 27—The National Association of Motor Truck Sales Managers, in a meeting at the Congress yesterday and to-day, gave particular attention to the expansion of business through better business and selling methods among dealers.

It was recommended that dealers install cost systems, increase their sales efficiency and eliminate price-cutting as methods of building a successful foundation under the manufacturing of trucks.

A committee will be named to confer with a committee from the N.A.C.C. on the matter of truck shows. So far as any preference was expressed it was for a show held at the same time as the car show, but in a downtown location.

The Motor Truck Manufacturers' Association also met and heard plans for work outlined by David Thomas, the new secretary. The manufacturers will meet again April 3, probably at the Congress in this city.

G. M. C. SAVINGS A SUCCESS

NEW YORK, March 29—Gratifying results from the first year of its operation of an employees' savings and investment fund are reported by General Motors Corp. Early in 1919 the company created a fund in which any employee could deposit $5 or multiples thereof up to 10 per cent of his annual wage, but not to exceed $300 a year. The plan provides that the corporation match each employee's savings by crediting his account with an amount equal to his deposits, paying interest on the total at the rate of 6 per cent per annum, computed semi-annually. A new class is started each year to terminate in five years.

In the remaining months of 1919, while the plan was in operation, 33,641 employees put into the class of 1919 $2,250,000. In the five years to Dec. 31, 1924, the company will match these savings dollar for dollar and credit interest semi-annually at the annual rate of 6 per cent.

Smith Springfield Succeeds Body Company

SPRINGFIELD, MASS., March 30—The Smith Springfield Body Corp., successors to the original Springfield Metal Body Co., first builders of the "Springfield Tops," and pioneers in aluminum bodies, has obtained a factory at West Springfield and will begin deliveries June 1 of high grade aluminum bodies which will be its exclusive output. The factory is 500 x 90 ft.

Hinsdale Smith is president of the company, Major Arthur P. Smith, treasurer, and Lieut. Col. C. S. Dame, secretary. The directors include Harry G. Fisk, treasurer of the Fisk Rubber Co., and L. de F. Munger.

NATIONAL GAGE UNIT READY

LA CROSSE, WIS., March 29—The National Gauge & Equipment Co. of La Crosse, Wis., expects to occupy a new factory addition of 30,000 sq. ft. about April 15 or May 1. It is 135 x 253 ft. and doubles the factory space. The concern is one of the largest makers in the country of automotive equipment specialties.

New Jersey Imposes Surcharge on Car Tax

NEWARK, N. J., March 29—Through the efforts of dealers and the Motor Truck Club of New Jersey, the proposed increase in motor truck licenses, which in heavier truck cases amounted to 100 per cent, has been modified to a surcharge of 20 per cent on the existing fee for all licenses during 1921.

Passenger cars are also affected by the surcharges, which in their case, supersedes a proposed tax of $1 per horse power. In pursuance to the legislative plan in substituting the surcharge for the tax on horse power, the legislature will appoint a commission to report at the next session a uniform motor vehicle law. The commission will be made up of all organizations affected.

An idea of the work accomplished by the dealers and truck club in obtaining the compromise fees, may be seen in the fact that the proposed license for trucks 24,001 lb. and over (loaded) was $250. Under the fees agreed upon it will be $70.80. Similar reductions were obtained on all trucks proportionately to their weight.

ATLANTA WOMEN BOOST ROADS

ATLANTA, GA., March 27—The Atlanta Woman's Club has organized a good roads committee to co-operate with the various automotive associations of the State and the civic and commercial organizations to secure a bond issue of $40,000,000 or $50,000,000 for the construction of good roads in the State of Georgia.